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[OFFICIAL NOTICE.]

Annual Meeting, New England Association of Gas Engineers.

LYNN, MASS., January 9, 1892.

The next annual meeting of the New England Association of Gas Engineers will be held at Young's Hotel, Boston, on Wednesday and Thursday, Feb. 17 and 18, and will be called to order at 10 o'clock, Wednesday morning, the 17th.

Persons eligible for active or associate membership can obtain application blanks from the Secretary.

Questions for the Question-Box will be published in advance if sent to the Secretary in advance. A list of papers will be given later.

C. F. PRICHARD, Sec. & Treas.

BRIEFLY TOLD.

THOSE who have received our circular inquiry, in respect to output figures for the last six months of 1890–91, show a fairly active interest in assisting us in compiling an authentic return, in that we are at this time of writing in receipt of replies representing 30 per cent. of the number of places addressed. Perhaps it is unnecessary to repeat—it certainly ought to be at any rate—by way of reassuring even the overcautious that these returns will be guarded rigidly from all peering eyes, and that no one will be the wiser for the confidence placed in us, so far as the revealment of any individual return is concerned, save those who will tabulate the figures and reduce them to percentages. These duties will fall on those who have been and can be trusted to do only as they promise. In view of the real importance to the whole fraternity of a knowledge of the percentages of general gain in their business from year to year, and which knowledge cannot be successfully denied in point of its accuracy, we again ask that all will respond to our effort to obtain a census of the gas output of the country.

GAS PRICES IN ENGLAND AND AMERICA.—The recent increase ordered in the gas rate in certain districts of the city of London has attracted some attention in this country, and it might also be an excuse here for making a slight comparison of the gas rates in this city and of those in London. Our information in respect to the advance in the London selling rate is that the increase amounts to about 15 per cent. This means that what is known as "common" or "ordinary" gas (a gas of about 17 candles) is to be sold at 77 cents per 1,000, and that the "cannel" gas (a gas of about 20 candles) distributed in certain districts, under the original charter of one of the Companies subsequently absorbed when consolidation was effected, is to cost consumers 95 cents per 1,000. The one rate in this city is $1.25 per 1,000, and the average candle power of the gas supplied is not below 25. Leaving the unit of light out of the consideration, and taking account only of the difference in cost of raw materials and of labor as between the two situations, it is easily determinable that the actual price of gas in New York city is at least as favorable to the consumer here as the price in London is to the consumer there—of course this deduction applies to the London cannel gas—but on the other hand, if the light unit is to be considered as between the two situations, with due heed also given to the cost of materials and *labor* in both places, to-

gether with the further influence exerted on the comparison of the difference in output, then New York's gas consumers are far more cheaply served than are those of London. In time it is more than likely that the disparity will be still more marked, for gas coals are advancing in price in England, while the direct tendency here is to a decrease in their price, and the same is equally true of the labor condition. In fact (these increases were ordered by the Gas Light and Coke Company, which is by far the greatest supplier of gas in London) it is a question whether or not the gas supply of the United States in general will not soon be carried on at a lower average than that now obtaining in the United Kingdom.

BUT THAT RESULT WILL NOT BE ADVANCED BY THE CRANKS.—It is of course satisfactory to know that we are approaching the above-named outcome at a rapid though convenient and safe pace, and it is more than gratifying and assuring to know that the advance has been made on lines with which years of acquaintance have made us familiar—in other words, that good engineering and conservative executive management are to be credited with the victory. This lets out the cranks—rather, it keeps them out—with their "greased wind" schemes and their gaseous promises. But while the intelligent gas engineer keeps along in the even tenor of his well-marked road to fame, if not to fortune, the average amateur investor, who would a process wooing go, seems to get further off the safe track than ever. Beauharnais, with his corn cob and potato extract patents; Harris, with his outfit of regenerative balls diagram, and other "fixings;" Proctor, Acme, Fiesse, Rew and the rest, with their this, that and the other, all manage to attract the moths to their particular candles. And so it will be for quite some time.

THE TROLLEY SYSTEM AND GAS MAINS.—Mr. Henry S. Whipple, Manager of the American Gas Company's Rockford (Ills.) works, writing to us under date of the 18th inst., mentions the following curious facts: "I would like to call the attention of gas men to the fact that electricity escaping from the rails of an electric street railway has ignited gas escaping from service pipes, while the latter were being connected. In one case a 2-inch pipe connected to the street main passed under the railway at a depth of about 3 feet—the main being about 7 feet from the nearest rail. In bringing the end of another pipe to the end of the 2-inch pipe, at a distance of 20 feet from the railway, a spark passed across the opening between the pipes and set fire to the escaping gas, which injured the workman quite severely. The nearest car was about 700 feet away. In another case the service pipe did not pass under the railway, as the connection was made on the side of the street where the main is laid. In several instances our gas fitters have received 'shocks,' or the gas has been ignited, while they were changing pipes in basements. I trust that this may be of use to some superintendents that they may warn their fitters of their dangers from electricity."

IMPROVEMENTS AT MONTREAL.—The Montreal Gas Company is keeping up with the pace in the growth of that beautiful Canadian city, and this, too, notwithstanding the electric lighting competition now prevalent there. During the year the Company completed a 500,000 cubic feet capacity holder, erected a large multitubular condenser and two 75 feet tower scrubbers, added new boilers and engines, extended the purifiers, and put in one of its stations a Brin's oxygen plant. Of course the usual minor alterations and improvements consequent upon these changes were also effected. In order to meet the increasing demand for gas the Directors recently concluded an arrangement with Messrs. Bartlett, Hayward & Co., of Baltimore, for a water gas plant on the Wilkinson plan, capable of producing 1,500,000 cubic feet per day. This plant is to be in working order next fall. There's progress.

SPECIAL WESTERN CORRESPONDENCE.

By SUNSET.

Dear JOURNAL: It is said that catastrophes, suicides, murders and such go in waves, being epidemic one year and comparatively quiet the next. Methinks that this applies also to the patent processes in the gas business; for if this isn't an unusually full year for such in the West, I am greatly mistaken. It is curious, too, to see how closely related they are this year in their workings. The fundamental idea, of course, is to make gas for from "3 to 7 cents" per M. I did see one reference to "$\frac{1}{10}$th of a cent"!!! To approach this in anywise means an enormous amount of gas to be made; to make lots of gas and not pay for raw material means, to use air! To handle lots of air means a *blower;* and, presto! There you have it. They are all built up around a blower as foundation-stone and substructure, and the details are varied to suit. Mark, if I am not right! You remember the Hall process, progeny of the Proctor, of which I wrote you some time ago. That was a Roots' blower at full speed pumping air through a fire-bed. The air was thus heated, and the more readily took up the oil added for "greasing it." The "electrodes" decomposing was the "detail" in this case. The speed of the blower determined the make of the gas.

Again the Bidelman "process," which has cropped up and spluttered at Adrian, Mich., Carthage, Mo., and elsewhere, under the cognomen of "The Acme." The air pump, driven by suitable power, forces air through a series of oil tanks until it is carbureted. "The speed of the pump determines," etc. This is such a nice process, too, to make a model of to show to prospective investors. You take six glass preserve jars partly filled with gasoline and fit them with lids, hose and tin dip-pipes. One has a piston in it; place a brick on the piston; force by its pressure a current of air through the jars seriatim, and it burns at the other end. I am told that the "detail" requisite in this process is powdered charcoal in each vessel through which to filter the gas *en route.* Positively nothing else will do. Which reminds me of the Beauharnais process from New Bedford that I read of in your last number, wherein *ground corn cobs* and *potato extracts* are seriously stated as part of the essentials of manufacture.

Another "Cold Process," almost the same as the above, uses a regular "fan" blower, when in operation, as its volume generator. Pretty nice, isn't it, to turn out gas as fast as a blower will whiz.

Take the very latest process—the Harris—referred to in my last letter. The show plant at Maysville, Ky., is equipped again with the ubiquitous blower (in this case a Root), which makes 65 revolutions a minute as it continuously feeds air into the machine, to come out gas at the other end, after the addition of oil. By the way, I heard a yarn lately to the effect that the Harris promoters have $2,000,000 backing, and *have secured* a franchise at Cincinnati, after some quiet work and big money expended. Likely, isn't it?

Seriously speaking, I have neither objection nor desire to deny credit to these processes and machines when kept in their proper spheres. Carbureted air has a good field and a proper one in the supply of isolated dwellings, mills and districts away from a gas supply. Also, in driving gas engines; and in a certain class of forge work it is an excellent medium. Air and producer gases, too, especially in heavy metallurgical work, with even from 30 to 70 per cent. nitrogen, do work recognized as of the best in numerous instances. But when such gases and processes are hawked around and offered as better than natural gas, and able to replace a clear coal or water gas for city illuminating purposes, and to be as good as such, then I think one can justly and should object and protest.

The subject is tiresome. Will it ever cease?

I hear that the Economic, of Chicago, has engaged H. S. Battin, of the old companies, as engineer, on a three year contract and at a figure which can be but pleasing to him, and that he has resigned his old position. That certainly looks as though the Economic had come to stay. Mr. Battin is well known from his long connection with the Consumers Company and South Side Stations in Chicago, and his familiarity with local conditions and work should make him an especially valuable man to the Economic. His friends wish him success wherever he may be. Another name was mentioned in connection with this position—one of the best known engineers that dwell along the lakes—but it is said his Company would not let him go at any cost.

The Chicago Companies' gas stove business must be partly responsible for the gratifying increase in gas sales last season, no less than 5,900 stoves having been placed by their efforts during the last year, leastwise, so I hear.

The Parker Russell Mining and Manufacturing Company has recently engaged Mr. Leigh Wickham, who will hereafter act as its travelling representative. Mr. Wickham is young and energetic, and promises to be as successful and popular as all connected with his enterprising house.

The Market for Gas Securities.

Consolidated was somewhat weaker, the opening to day (Friday) being made 101 to 103. Other city shares show no change. The special election in the Standard Company, held on the 21st, to add two members to the Board of Directors, was on a par with other proceedings in the management (?) of the Company. A shareholder named Scholonecker proposed to batter Director Andrews with a walking stick, while Andrews awaited the charge with the coolness of an armed man. When the uproar was over the resignation of Vice President Dana was accepted and Emerson McMillin and E. B. Carey were elected to the Board, and Mr. McMillin was chosen Vice President. The curtain fell to quick music and much luridity. Over in Brooklyn things are about as they were. Chicago gas was steady, and Bay State shows no change. The Laclede Company's quarterly dividend of 1¼ per cent. on the preferred was declared, payable on the 15th of March. At auction: 10 Mutual, city, at 122. 584 Brooklyn, at 123–123¼: $6,625 scrip, Nassau (Brooklyn) at 99.

The January Meeting of the Gas Club of Chicago.

The Gas Club of Chicago met on the evening of January 15, as per call, at the Weber Catering Company's Restaurant, 31 Washington street, Chicago. A business meeting was first in order. The minutes of the previous meeting were read and approved, and six applications for membership were handed in—viz., S. S. Stratton, with Harris Bros. & Co., Chicago; Geo. S. Harris, Manager Mansfield (O.) Gas Company; Henry S. Whipple, Manager, at Rockford, Ill.; John S. Unger, with Fred. Bredel, up in Milwaukee; Leigh Wickham, representative of the Parker-Russell Mining and Manufacturing Co.; C. W. Mead, Assistant Engineer to the Economic Company, of Chicago. These applications were indorsed by members and passed by the Managing Committee, and they were unanimously accepted by the Club and the applicants given full membership.

The total membership of the Club as now enrolled numbers 60, which is pretty good.

The report of the Managing Committee, by the Secretary, referred chiefly to the proposition to supply the Club with badges. It was decided that the Club should remain unique among American gas organizations, by not blossoming out with a badge; it was felt that there was yet time for this, and it would be more expedient to defer the matter until later.

A letter from Henry C. Rew was read, approving of the Club in general, and especially of its policy of keeping down the dues to the nominal cost, so that encouragement would be given for membership to every gas man—especially the younger men, who have yet their spurs to win and their fortunes to make.

The chief announcement of the report was that the annual meeting of the Club occurring in February (or the next meeting) would call for election of officers for the ensuing year. Messrs. S. S. Stratton, R. F. Fitz, and H. Harper were appointed a committee to report nominations at the next meeting. The offices to be filled are the general offices for the year, and two members for the Managing Committee to serve for six months. There was no especial new business.

The question of entertainment at next meeting, however, was taken up, and it was unanimously voted to bend every effort to make the next or annual meeting a noteworthy one. The Secretary was instructed to arrange for the gas men to meet at about 4 o'clock in the afternoon, when a paper would be given and the regular business and discussion held. Supper will then be served, after which the members will probably go to the theater in a body. A thoroughly enjoyable programme will doubtless be gotten up, and not the least feature of it will be a send-off to the departing President, Mr. Howard, who will leave Chicago shortly afterward to take charge of his new property at Galena.

The Question-Box was then in order. The chief question was upon the proper exhibits at the World's Fair by gas companies and by manufacturing houses. This precipitated a general discussion on the World's Fair project, which brought out much comment. The latent power of the Club was brought to the surface, and the matter was discussed at great length. It was felt that the Club, as representing Chicago interests, and especially able to judge of conditions here, should put itself on record as to its position and feeling in the matter; and it has so determined that a committee should be appointed who should draw up a statement covering the Club's position and report next meeting. The President appointed that committee as follows: F. H. Shelton, George Yuille, Carl Bradley, E. Morrell, S. S. Stratton, and the President of the Club, ex officio.

The Club then adjourned to one of the neighboring rooms, where full justice was done to a very good supper. Each member paid for what he ordered, or joined a small party; and the arrangement was felt to be much more satisfactory than the previous suppers of the Club, where a guarantee of so much a plate had been required, and the members felt that they had to turn up and eat a given amount, whether or no.

The meeting as a whole was thoroughly enjoyable, and indicated that the Club is getting down to the precise point of its purpose of organization—getting a small party of local gas men together once in so often, for thoroughly informal enjoyment from their mutual interests, and having at the same time a beneficial and instructive vein running through it.

Very truly, F. H. Shelton, Secretary.

Testing Steam Gauges.

At a meeting of the Engineers' Club, of Philadelphia, Mr. H. W. Spangler, in speaking on this subject, said that the testing of steam gauges, as usually done, is simply a comparison with some other gauge, which, at some other time, has been compared with a standard of some kind. The mercury column, the Shaw gauge, or some form of spring gauge is used as a standard. The mercury column is unhandy, and few are to be found that can be rapidly used. The Shaw gauge must be calibrated, and is no more a satisfactory standard than a good spring gauge. There is another apparatus that is often used in gauge testing, that is the square inch made by the Utica Steam Gauge Company. This is nothing more than a lever safety valve, having an area of 1 square inch, which can be loaded to any amount.

Not long since I saw in the works of the Crosby Steam Gauge Company a device which was new to me,* and which seemed to me to be about the right thing for gauge testing, especially where much of it had to be done. Near one end of a small table or stand, a tube was set up vertically, and in this tube fitted a piston of exactly ¼ inch area. At the opposite end of the table was fitted a second vertical tube, to which is attached the gauge to be tested. These vertical tubes are connected by a small tube running under the table. To the center of this connecting tube a branch running to a reservoir is attached, the reservoir being higher than the top of either of the upright tubes. The top of the piston before spoken of carries a flat circular disk, on which weights are placed as the testing proceeds.

The method of using the apparatus is as follows: The reservoir is first filled with oil, which is also allowed to fill the two vertical tubes. The gauge to be tested is attached to the vertical tube on one side of the table, and the piston is placed in the other vertical tube. The connection to the reservoir is closed, and weights are placed on the piston head, the corresponding pressure showing on the gauge. To eliminate the effect of friction between the piston and the tube, the piston and weights are given a rotary motion. It is found that if the gauge is tested both up and down the scale, the same weight on the piston always brings the pointer to exactly the same position.

The Decay of the Contract System.

A writer in the London *Journal*, in commenting on this subject, says that something was said in the "Retrospect" of the the past year, which was given in the last number of the *Journal*, respecting the difficulty of noting at the time the beginnings of fresh industrial movments which afterwards develop sufficient importance to render memorable the era of their birth. One always seems to be living in an age of small things. Everything must have a beginning; and this beginning is usually so small and obscure that it is next to impossible to predict its future increase until this has become manifest, when prediction has to be changed for history. So many of the tendencies of the age in which one lives die out before coming to anything; so many promising beginnings never get any farther; so many revolutionary principles, in industry as well as in politics and social affairs, wilt under our eyes, even while their propounders are busily occupied in explaining their nature and object—that wise observers of the signs of their own times are careful how they form the opinion of any particular movement that it contains within itself the guarantees of growth and endurance. It is therefore with some diffidence that we invite the attention of our technical readers to the consideration whether, and to what extent, it can be said of the last year or two that they have witnessed the commencement of the decay of that once potent personage, the general engineering contractor. The question is both interesting and important, and has, moreover, so many bearings, that, unless its application is strictly limited to a particular order of cases, it will be extremely difficult to arrive at a definite conclusion in the matter. It may therefore be admitted at once that, for some purposes, we are likely to have the building and engineering contractor among us for many years longer. So long as non-technical bodies and private individuals continue to require, as they do, all kinds of building and engineering work, so long will they prefer, in the majority of instances, to contract with skilled persons for the execution of such work for a lump sum, in order that they may know what they will have to pay, and be relieved of all responsibility for the due performance of the constructor's task, whatever it may be. It is obvious, however, that contractors for the construction of building and engineering works have hitherto found employment under a very much more numerous and influential order of patrons than such as come into this category. It has been, and still is, customary for industrial and commercial concerns of all magnitudes to "put out" their constructional work, as well as may other services, under contract; and it is in connection with this class of contractor's patrons that we desire to discuss the question which constitutes the text of this article.

The term "contractor" is almost as elastic as that of "commission agent" in trades and industrial vocabularies. Of very many so-called

* Mr. Spangler subsequently reported to the Club that he found a description and cut of this device in *Mechanics*, Vol. III., p. 227.

contractors it may be said that they are nothing else than middlemen; and the latter term has not a pleasant savor in the nostrils of the present generation. Contractors have had a great deal to do with the business of gas supply, from the earliest times to the present day. It was once a common thing for contractors to occupy the middle place between a gas company and the consumers. The gas company was merely the financial organization for bringing gas lighting into a particular district; the works were built by contract, and managed by contract. It was nothing less than a revolution in the gas supply of whole provinces of the United Kingdom when gas companies were prevented from delegating their responsibilities, and gas works lessees were consequently disestablished. We have no intention of bringing a general accusation against lessees of gas undertakings. There were black sheep among them, of course, and the temptations of the position were such as to handicap honorable dealers. But there were many able and honest men in this line of business, whose example spurred the statutory companies to conduct their affairs upon commercial principles. Moreover, the age of the gas works lessees was the hey-day of middlemen. Vast undertakings of every kind now administered at first hand, were farmed out to shrewd business men, who, for guaranteeing the capitalist his dividend or interest, were allowed the fullest opportunity of scraping an additional profit for themselves. There have been few industrial movements of greater moment in this century than the general suppression of the order of "lessees"—that is to say, of middlemen contractors.

When the lessees disappeared, however, gas companies, like railroad and steamship companies, and many other well-established interests, still found themselves committed to a system of business of which contractors held the keys. Everything that was purchased was contracted for; and it was the same with all services that demanded anything like commercial aptitude or organizing ability in the performance. Either gas company directors entertained a profound distrust of the capacity of their officials, or the latter aimed at making things comfortable for themselves at any cost. But, whatever the motive, it is certain that many gas companies continued the practice of paying dearly for the convenience of relying upon middlemen for performing services which the company's own officers ought to have undertaken. Would we could describe the custom as obsolete. Unfortunately, it is too well known that it is still rooted in the policy of many gas administrations; and the fact that these are the undertakings which are unable to sell gas cheaply, does not appear to enlighten those who are responsible for maintaining such practices. It is only when fossilized directors and managers are removed in the ordinary course of nature, that radical alterations of policy can usually be effected.

Yet there cannot be any mistaking of the right course in this regard, by those who keep their eyes open to what is going on around them. One after another the gas companies, water companies, and railway companies of the United Kingdom are doing more and more of their own work, and emancipating themselves in the same measure from the burden of maintaining contractors in the position of middlemen. The contracting system is crumbling on all sides, and dying out altogether wherever it can be spared. Some undertakings are more advanced than others in this respect; but if we confine our observations to the gas industry alone, it would be easy to find striking examples of companies and local authorities doing for themselves, with the greatest ease and comfort, things which more backward administrations still continue to "put out" to contract. Some gas companies do not seem able to set a retort, build a shed, lay a main or a service pipe, discharge a cargo of coal, get in a barge-load of bricks, repair a stove, or paint a gasholder without employing contractors. Why is this? There may be two reasons for putting out the work of a gas factory to contract: It may be very casual or infrequent work; or the management may be weak, and unwilling to incur responsibility. The former, so far as it goes, is a good excuse. Nobody would expect a gas company to keep up gasholder-making plant for use only every six or seven years, or to provide an iron foundry for the casual repair of castings not in sufficient demand to keep a moulder occupied. But when work is contracted for outside merely because of incompetency at home, it simply means that the cost of management is indirectly increased accordingly.

It is a difficult and often a thankless task for a gas manager who has been trained in a modern undertaking, where everything possible is done on the premises and at first hand, to break through the contrary system when he finds himself in independent control of a works whereon contractors have battened from time immemorial. He feels constrained by his sense of duty to stop the multitudinous issues which he sees to be draining the life-blood of the concern; but where is he to begin? Next to his Board, the first people he comes in contact with are the contractors for coal, cartage, lighterage, building, repairs, mainlaying, and all the rest of it; and, it is necessary to say that, from the manner in which some of these gentry are recommended to his kind consideration by old stagers on the Board or in the undertaking, the new manager is often able to form a shrewd opinion as to where lies the greatest interest in the contracts. Even where there is no apparent ground for suspecting the existence of those "wheels within wheels" which make of some gas undertakings such marvellously intricate pieces of mechanism, the manager or the director who comes fresh into an old-fashioned concern of the kind, will do well to keep his reforming zeal out of sight for awhile, until he has the run of the "ins and outs" of the whole affair. The contractors are such capital good fellows, as a rule, and do their work so well—when things are going straight—that it seems a thousand pities not to leave well alone. An opportunity for making a change is certain to present itself sooner or later, however; and then is the time for the reformer to show whether he has the tact by which reforms are carried out without giving offence, as well as the knowledge of what ought to be done. The best aid to the disestablishment of the contract system is command of the history of contracts; and in this record, the back volumes of the *Journal* are rich.

For it is of the essence of the contract system that it shall be profitable to the contractor. So long as this condition prevails, everything will work well. When the circumstances change, however, the trouble begins; and those who patronized the contractor in order to save themselves trouble, discover that he expects to be paid for doing their work at a higher rate than they could do it for themselves. Moreover, there is something very unpleasant in the spectacle of a local authority, or a gas company protected by statute in the enjoyment of good dividends, wringing the last sovereign out of a poor wretch of contractor who has put himself between the rich corporation and an adverse market. We have published so much upon this aspect of the question on former occasions, that it is unnecessary to say much about it now. Contracts when made must be upheld, of course, or the fabric of the industrial world will fall in pieces. It is worth pointing out, however, that the unrighteousness of Shylock consisted, not so much in insisting upon his bond (in which he was justified by the law) as in proposing the terms of that remarkable contract, which the other party was constrained to accept. So that one's sense of justice is offended when a municipal corporation or a statutory gas company, neither of whom can lose money by the influence of adverse markets, enters into engagements with unprotected contractors which may result in the ruin of the latter from this same cause. If the form of a contract must be adhered to in the matter of purchasing gas works supplies, the only sound policy is to shorten the term during which the engagement is binding.

When a contract has been made, it is as a rule highly undesirable to vary its terms in any important respect. We too frequently hear of gas coal contracts which, on account of an alteration of views on the part of the buyers, or for some other plausible reason, are tinkered out of all shape before they run out. It is notoriously the policy of some coal contractors never to allow a contract to run its natural course, if they can help it, without making it the subject of some "arrangement," or "understanding" having reference to future business. This is a peculiar vice of the system of long coal contracts; and is only to be avoided by restricting the duration of such engagements to periods which fall within the range of ordinary commercial providence.

It may be remarked by some professional readers that, while the evils of the contract system can be avoided or mitigated in regard to gas works supplies, repairs, etc., it is not so easy to do without the engineering and building contractor in carrying out constructional work. We believe, however, that the usefulness of the contractor is usually overrated, even for this class of work. Structural iron and steel work must of course, be contracted for, except under extraordinary conditions which need not be discussed here; but speaking generally, most works of construction required by industrial organizations, such as gas companies, need not be "put out" in this way.

When the engineer is a capable designer, and the contracts are properly prepared for competition, it will frequently be found that the contractor's profit, and the incidental expenses of having work done in this way, far exceed any possible advantages derivable under the system. The contractor has to protect himself against loss, of course, and this can only be effectually done at exorbitant cost to the client. Why not, then, dispense with the contractor in his conventional capacity as the middle man who is to make the greatest profit, or bear the loss, if any, on the job? This is what many well-managed industrial concerns are doing, and the movement constitutes, unless we are greatly mistaken, a noteworthy sign of the times. Engineers and managers of gas works who have not yet felt this movement may regard the idea with some apprehension, as implying an addition to their responsibilities without

necessarily improving their position. This fear is groundless. An engineer who is worthy of the name, who not only knows how to design a structure to meet his own requirements, but is competent to see that it is properly made or built, as the case may be, not seldom experiences many qualms at the thought that all his plans must be committed to the tender mercies of a tradesman whose interest lies in fulfilling his obligations in the cheapest style permitted by the terms of his specification. How much more comfortable would such a designer be if he knew that the responsible builder, the head of the executive work, would be an agent of his own, with the same interest as himself in having good work done? The idea is not that the designer or the engineer shall always necessarily also be the working head of the executive staff. On the contrary, it is usually preferable that the supervising and the executive staff should be distinct, although the engineer would naturally be supreme over both departments. The great point is the avoidance of the creation of the separate interest of the contractor, which may usually be secured more easily than some engineers inured to the ordinary system are apt to believe. This, as we take it, is one of the salient features of later engineering practice; and it is certainly a feature that able and conscientious engineers have no reason to find fault with.

Municipal Ownership of Gas in the United States.

[Extracted from the papers contributed by Edward W. Bemis, Ph. D., to the records of the American Economic Association.]

Practical Details of City Ownership.—Nine cities in the United States now own their gas works. Their population, according to the census of 1890, the date of beginning ownership and date of financial year for which full returns have been obtained, are given in Table I.

Four of the 9 cities are in Virginia, 1 is in West Virginia, 2 are in Ohio, 1 is in Kentucky and 1 in Pennsylvania. Three began city ownership from 38 to 50 years ago, although real control by the people is only 4 years old in Philadelphia. All the cities save Hamilton, O., having tried city ownership more than 14 years, rightfully claim that the matter has with them passed beyond the stage of experiment.

Table I.

Name of City.	Population.	Date of Beginning City Ownership.	Financial Year for which Returns have been Received.
Philadelphia, Pa..	1,046,964	1841	January 1—Dec. 31, 1890.
Richmond, Va....	81,388	1852	January 1—Dec. 31, 1890.
Alexandria, Va...	14,339	1853	June 1, 1889—May 31, 1890.
Henderson, Ky. ..	8,835	1867	June 1, 1889—May 31, 1890.
Wheeling, W. Va.	35,013	1870	April 1, 1889—Mar. 31, 1890.
Bellefontaine, O...	4,238	1873	July 1, 1889—June 30, 1890.
Danville, Va.....	10,305	1876	January 1—Dec. 31, 1890.
Charlottesville, Va.	5,562	1876	July 1, 1889—June 30, 1890.
Hamilton, O.....	17,565	1890	May 1, 1890—April 30, 1891.

As far as my inquiries could be carried—and all citizens whom I could meet in the cities visited, or on the trains going to and from them, were questioned—general satisfaction prevails over the results of city ownership. No one expressed any desire to return to private ownership, or any faith in the objections of many writers that city ownership is dangerous paternalism, or interference with private rights, or that it leads to corruption of politics through an enlargement of the number of offices. But more of this later. As several of the cities have lately refused good bids for the lease or purchase of their works by private companies, this is a good proof of the general satisfaction with city ownership. Says Mayor Fitler, of Philadelphia, in his annual report dated April 6, 1891:

"During my term of office a number of inquiries have been received from other cities asking for information in reference to our gas and our water works—whether the city owned the plants, and if she did, what was the revenue from them, and how they were managed. In each and every case I have found that the inquiry came from places where the gas and water works were owned by private corporations, and that the municipality desired to purchase them, and not a single inquiry came from cities which owned their works and which desired to sell them."

Returning to the above table, it will be noticed that four cities have a population of from 4,238 to 10,285, one city has nearly 20,000, one 35,052, one 80,838, and one over 1,000,000. Thus most types of cities, as regards size, are represented. It is so hard to get full returns by correspondence that it has been found better in most cases to give the returns for the year for which returns were obtained on my visits to the cities in August and December, 1890. When later returns have been received by mail, use will be made of them as far as possible. Unless otherwise stated, the dates will be those first given in the last column of Table I.

Leakage.—It is impossible to prevent all leakage in the distributing pipes. Beyond a certain point that varies according to cost of the mains and rate of interest thereon, it is cheaper to allow some leakage than further to improve the mains. A little gas is also necessarily used at the works and at the office, but undoubtedly leakage beyond 10 per cent. is excessive, and is due to failure to expend sufficient money in the renewal of old mains, as they rust out, and in the exchange of small mains for large ones as consumption increases, or is due to lack of good and sufficient holders. Where the mains are too small it becomes necessary, if the gas in the burner is to be good, to put on such a pressure at the works as to cause greater leakage, and in some cases when carried very far, even blowing of gas in many burners. This blowing indicates that more gas is being forced through the burner than is properly consumed, and meters will record an unduly large amount of gas.

Table II.

Name of City.	Amount of Gas Made in Holder.	Amout of Gas Used in Burner.	Percentage of Gas in Holder Borne by Leakage, Gas Used at Works and Unaccounted-for Gas.
Philadelphia..	2,177,073,000 feet made. 1,134,922,000 purchased. 3,311,995,000 feet.	2,857,589,286	13.72
Richmond*...	196,990,600 "	173,343,500	12
Alexandria....	19,712,000 " about.	16,659,948	15.5 about.
Henderson....	11,626,000 "	9,998,330	14
Wheeling.....	131,320,800 "	115,540,480	12
Bellefontaine..	8,760,000 "	8,235,400	6
Danville†..	11,013,600 "	9,900,400	10
Charlottesville	6,717,000 "	5,865,000	9.9
Hamilton.....	30,425,600 "	27,131,900	10.8

* In 1889 the amount made in Richmond was 185,162,900 ft., and amount used was 166,769,887; so the leakage was 10 per cent.

† During 1889. In 1890, owing to a freshet which much injured the works, the leakage was 15 per cent. The works were repaired as soon as possible.

The need of larger mains is fully realized in Alexandria and Philadelphia by the mayors and gas officials, and improvements are rapidly being made in the latter city, and are strongly urged in the last address to the Council by the Mayor of Alexandria. Mr. R. T. Cook, Secretary of the Alexandria gas works, writes under date of April 21, 1891, stating that probably after July something will be done to improve the street mains and benches at the works, and thus diminish the leakage and lessen the cost of making. Philadelphia has a good excuse in the fact elsewhere explained that only for four years have the people had any real control of gas matters. The works in the hands of that parody on popular government, a gas trust independent of public control, naturally were not kept in good condition. But with the overthrow of that trust in 1886, the merits of city ownership in Philadelphia have for the first time had a fair test. The recent increase of leakage in Richmond is due to leaks in the holders which could not be adequately repaired because the City Council has thus far failed to appropriate the money asked for by the Superintendent for a new holder, and the old holders could not be dispensed with long enough to permit of repairs during the winter of 1890–91, when the leaks became large. The Superintendent writes, however, that he expects to make the needed repairs during the coming summer and thus to "reduce the leakage to the minimum."

Now, the important question is, Do private gas works have less leakage on the average than do public? Comparison can be made with 58 gas companies in Massachusetts in the year ending Dec. 31, 1890, for which alone any reliable figures on this point are accessible. Only those companies are taken which not only make gas, but also deliver to private consumers. In Boston the leakage is 8.44 per cent.; Brockton, 18.42; Fall River, 14.11; Charlestown, 13.31; Lawrence, 8.12; Lowell, 4.04; Lynn, 12.63; Worcester, 5.69; Chelsea, 14.91. The average rate of leakage, found by dividing the sum of the leakage rates by the number of cities, was 11 per cent., while in the cities owning their works it was 11.3 per cent.; and leaving out Alexandria, 11 per cent. The average leakage, found by dividing the total leakage in feet in all the cities by the total amount made in these places, was 9.34 per cent. in Massachusetts, and in the public gas works 13.5 per cent But this is hardly a fair comparison, owing to the vast preponderance in the sum totals of Philadelphia, whose large leakage is due to the sad condition of the works when handed over to the Mayor by the Gas Trust four years ago. Despite the rapid progress since 1886, the poor, leaky mains, over 30 years of age, will not be entirely replaced by good ones for two or three years yet.

If Philadelphia be excluded, the average leakage in the other 8 cities

in 1889 or 1890 was 12 per cent., and in the 58 cities, outside of Boston, in Massachusetts it was 10.7 per cent. In the matter of leakage, then, there is not much to choose between the public companies of the United States and the private companies whose accounts have been published. The leakage in Hamilton was 21.9 per cent. the first six months of the year, which was the first year of city ownership, and fell to 4.89 per cent. during the last half of the year. The average for the present year is therefore likely to be much below 10.8 per cent.

Price of Gas and Number of Consumers.—We next consider the price of the gas sold, the amount of the gas consumed per capita, the number of consumers, the ratio of consumers to population, and the amount of gas consumed per consumer, though from 1 to 13 per cent. (even 43 per cent. in Hamilton) of what is included under this head is burned on the streets and in public buildings, as given in a later table. Reference is always made to gas in the burner, not in the holder.

Table III.

Name of City.	Price of Gas per 1,000 Feet.	Amount of Gas Consumed per Capita. Feet.	Number of Consumers.	Percentage of Population Borne by Consumers.	Amount of Gas Consumed per Consumer.
Philadelphia.....	$1 50	2,734	134,555	12.9	21,237
Richmond[1].....	1 50	2,140	6,508	8.0	26,482
Alexandria.....	1 62[2]	1,148	800	5.5	20,825
Henderson.....	1 50[3]	1,132	351	4.0	28,485
Wheeling.....	75	3,301	3,300	9.4	35,012
Bellefontane.....	1 00	1,915	387	9.0	21,280
Danville.....	1 50	945	494	4.2	21,734
Charlottesville.....	1 50	977	450	7.5	13,033
Hamilton.....	1 00	1,544	612	3.5[4]	45,009

1. After March, 1891, the price is to be $1.25. 2. Reduced Sept. 15, 1890, to $1.44. 3. Reduced Feb., 1891, to $1.25. 4. It will soon be 5 or 6.

The prices in Table III. are those charged when payment is prompt. In the following cities the prices are higher when payment is delayed: In Richmond 5 per cent. is added; in Charlottesville and Hamilton, 10 per cent. is added; in Wheeling the price becomes $1, and in Danville $2. There are few delinquents to pay these higher prices.

In the report of the Massachusetts Gas Commissioners, dated January, 1891, it is stated that "the average price to consumers of coal gas, of 24 companies, making annually more than 30,000,000 feet each, is $1.39 per 1,000 feet. The average price of the remainder of the coal gas companies is $2.015, making an average for all of $1.446 per 1,000." These figures are found, not by averaging rates, but by dividing the total amount received for gas in all the cities by the total number of feet burned. The average price thus found in Massachusetts would be higher than the average price in the 9 public companies, were it not that Philadelphia, from its large output of gas and its comparatively high price, for the sake of a very large revenue to the city, brings up the average to $1.46. In Massachusetts, however, the cost of making is from 10 to 20 cents per 1,000 feet greater than in the cities along the Ohio river, but less than in Virginia. The average rate in Massachusetts, $1.97 in the 60 coal gas companies, much exceeds that of the public owned works, which is only $1.32.

Perhaps a fairer comparison would be that between public and private companies in Virginia, West Virginia, Ohio, and Kentucky, where alone both kinds exist. According to Brown's "Directory of American Gas Companies" for 1891, it appears that there are 8 private gas companies in Virginia. Of these one charges $3, one $2.70, three charge $2, two $1.60 to $2, and one charges $1.40. Three of the public companies charge $1.50, although Richmond at the end of the year will reduce to $1.25, and a fourth charges $1.44.

In West Virginia one of the five private companies charges $2.25, two charge $2 (with some discount for prompt payment), one charges $1.60, and one $1; Wheeling asks only 75 cents.

In Pennsylvania 55 of the 89 private companies charge over $1.50, and 29 charge $2 and upward. Eight charge $1.50, as in the public works of Philadelphia, and 26 charge from $1 to $1.45. Of the latter, eight, located where gas coal is much cheaper than in Philadelphia—such as Allegheny, Pittsburgh, Monongahela, Meadville, and Titusville, charge only $1. Philadelphia in reality, however, gets her gas only for about a dollar, since the extra 50 cents is clear profit, which she covers into the city treasury.

In Ohio, of the 43 private companies only four charge $1, the price of the two public companies, and one charges 95 cents. The company charging the latter price is at Hamilton, and was charging $2 until the construction of the public works compelled the reduction. The pressure must be so great, however, to carry the gas through the small mains that the many citizens met by the writer in Hamilton believe that the city gas is really cheaper. The four private companies in Ohio charging $1 for gas, in whatever quantity, are at Cleveland, Columbus, Sandusky, and Troy. In Cleveland, and perhaps in the other cities, the reduction to $1 was forced by the City Councils, in accordance with Ohio law.

Milwaukee and three cities in Illinois charge $1 per 1,000, and two companies in Terre Haute, Ind., in fierce competition for the time being, and using some new processes of manufacture, are charging, according to Brown's Directory, only 35 cents. Wheeling has the lowest price of any cities known to the writer in the five States where there are any public-owned gas companies, and in Ohio, West Virginia, Virginia and Kentucky the price of the public companies is as low or lower than that of any of the private companies. In Kentucky none of the 18 private companies sell as low as $1.25, the price in Henderson.

Philadelphia, acting on a principle to be discussed later, prefers to keep the charge for gas at $1.50, though all costs are only 84 cents and are yearly falling, in order to secure gas free for public use, and also a large cash income. Similar reasons keep the prices in most of the other cities considerably above cost. This point must always be kept in mind in comparing the prices of public and private companies. The charges on Prussian state-owned railways, for example, may not be much, if any, lower than with us, but the net income from them more than pays the interest on the entire state debt of about $1,100,000,000. Similar financial results are reported by Mayor Fitler, of Philadelphia, in his report, dated April 6, 1891, wherein he says that "either the water works or the gas works, now the property of the city could be mortgaged for a sufficient sum, at 4 per cent. per annum, to pay the balance of the city debt not now in the sinking fund; and after paying the interest on such a mortgage, either of the works would yield to the city a credit balance of not less than $500,000 annually. The value to the city of Philadelphia of these two properties will never be realized until she loses either of them, and I sincerely trust that the day is far distant when either of these great and valuable properties will be either leased or sold."

(To be continued.)

Electrical Exhibits at the Columbian Exhibition.

[A paper read by Mr. John P. Barrett before the Chicago Electric Club.]

Electricity, as an adjunct to industrial procedure, has ceased to be empirical. Its practibility, economy and the conveniences of its employment are settled and incontrovertible facts. Its conduct under fixed conditions is no longer problematical. The laws which rule its action are as inviolable as those of the exact sciences, as constant as those of nature, of which they are a part.

In making plans, therefore, for an exposition of electrical development, the practical side of the question must be ever uppermost. The chief aim must be to demonstrate beyond cavil that as a factor in the affairs of this workaday age electricity cannot but be taken into great account. This, the chief feature, however, would fail of its force were we to neglect to demonstrate at the same time the immense strides that have been made since electricity emerged from a state of mystery and became one of the essentials of civilization and progress.

Following out this preliminary reasoning, I think it necessary to treat practical electricity in classes according to the importance and relationship of its application.

The question of railway and other processes for transporting passengers and freight is the most vital economical issue of the present day. Steam, either by locomotive or cable, has been the only feasible motive power up to within a short time. The manifold objections to it, however, have increased the activity of inventors and the possibilities of rich reward have been a stimulus to the energy of electrical workers. Electricity, in some branches of this service, is already a success, and is fast displacing other motive power. The next few years—possibly the next few months—will probably see the whole question finally settled by some new element or the further development of one or the other of the existing electrical systems. It will be part of our duty, therefore, to give every facility to exhibitors to make displays of new systems and to exploit old, along new lines and under new circumstances. In order to do this it is contemplated to set aside a parcel of ground at some point of the exposition on which to build trial tracks, which may be equipped for the different systems. We should make it possible for every system to be demonstrated, so that not only the electrical people may judge of the respective merits but that the visiting capitalists and possible customers may have ready facilities for becoming interested in the subject itself or in any of the various inventions or systems on exhibition. It is to be hoped that in this class of work the electrical people will submit something which shall decide the question of transportation wholly in

favor of electricity—as is already in part done—whether it be by means of overhead, conduit or accumulator systems. I have only to say that the public at large, and those who are interested in the question from a financial standpoint have high anticipations in this direction, and there is a disposition to wait for developments.

Electric lighting, arc and incandescent, has already arrived at the point of a practical success. For illuminating purposes electricity is accepted and stands without competition. The development in this direction will be as thoroughly demonstrated at the Columbian Exposition as it is possible to conceive of. All the various systems of lighting and of the transmission of power will be placed in practical operation for service. Nearly, if not quite, 25,000 horse power will be applied to electrical transmission at various parts of the grounds and buildings. It is contemplated to engage each company undertaking work, to wire and equip the territory allotted, furnish its own lamps, materials and supplies, so that each company's system of construction and operation will stand entirely alone, to show its special merit or to receive condemnation for failure. In this work it is contemplated to bring into friendly but brisk business competition the companies and systems of this country and Europe. The question of the saving of energy by the perfection of machinery and insulation will be closely calculated, and the various systems will be thoroughly tested by efficient juries, on the awards, of which more hereafter. Artistic lighting of theaters, hotels, residences and streets will be given an impetus, placed as these features will be in competition with art in every other conceivable dress. The brisk, practical business methods of the electrical people of this country have left little time to art and aestheticism up to the present time, while the people of Europe have, on the contrary, led art and electricity hand in hand. The Columbian Exposition may have some surprises in store for visitors in this behalf, and will undoubtedly be a source of much pleasure and instruction.

The transmission of power from sources at points along available water courses, or in the immediate vicinity of fuel for steam, and remote from the desired point of application, has been given much attention of late, and much newspaper comment has been made upon alleged successful inventions. This has seemed to me surprising, coming from electrical journals at least, since all of us in this country ought to be aware of the fact that long distance transmission has long been an accepted application of electricity in the mines of the West and Southwest, and has done much toward revolutionizing the process of mining. At many points in the West far removed from fuel for steam, and at long distances from water power, mines are being successfully operated that could not have been so where fuel was to be delivered at the mine instead of the developed power ready for application. Some new things have come into practice in this field of electrical work, in Europe of late, and at the Columbian Exposition we will see an increased interest in this work of transmission. There is in contemplation, moreover, a project to make a most instructive object lesson by placing in practical operation an electric plant operated by a water wheel, with wiring and terminals for application at an artificial mine some distance away. The many applications of the electric current, of various quantities and qualities, in mining and milling work, will come under this head, and I am assured of some new and valuable contributions in the way of machinery.

In the whole field of electrical invention, moreover, there are promised models of invention setting out new principles, and numberless contrivances will be a part of the exhibit to testify to the large measure of usefulness of electricity in the various directions of its application. It is hoped also that the exhibits will be object lessons to the general public, and that they will inculcate the fact that there are legitimate uses of electricity, and that on the other hand there are applications which closely border upon the fraudulent, and which are mere catchpennies and brought forward wholly because of the mystery and hocus pocus that surround them. I feel it a part of the duty of the department of electricity to unreservedly oppose the presence of these things and by discountenancing them, have an effect in a degree to rob them of their harmful influence. People must come to understand that electricity is not a mysterious force, uncertain in its operation and liable to all sorts of eccentric deviation from the desired course. Until this understanding has been reached, the electrical people will suffer more or less from frauds practiced by the unscrupulous, and will meet with obstructions in the shape of legal injunctions to prevent the laying of electric roads and lines of wire for transmission, and the actual dangers of electricity will be magnified many fold by those interested in restricting its use.

The remaining feature of the electrical exhibit, but not by any means the least for being mentioned last, is that part which will create object lessons on electrical progress—the historical exhibit. It would be impossible to fully appreciate the greatness of the progress made and the magnitude of the work of making commercial electricity what it is today, without the presence at any exposition of the first crude machinery, the initial appliances by which the electrical current was made a useful force. It is contemplated to have some of the original models, and where this is found impossible, to have reproductions of the models of the apparatus of Morse, Franklin, Henry and many others of our own country and those of Ohm, Ampere, Gauss, Siemens and many others of Europe. The department is in correspondence at the present time with those people or governments that have control of museums or institutions of learning where any of this historical apparatus may be, and we earnestly hope to have a full exhibit of these priceless treasures.

It is not contemplated by the national authorities of the Columbian Exposition to offer awards which would have so great an intrinsic value as to attract exhibitors but it is contemplated to make the standard of excellence so high that the bare acceptance of an exhibit by a department will be a lasting and distinguished honor. In the electrical department the space available for exposition purposes will be so small, as compared with the demand, that the greatest judgment will have to be brought into play to decide what exhibits are worthy of a place, and what will have to give way. It will be impossible to accept all. Therefore, the presence of an exhibit in the electrical building will be a testimonial of its unusual merit. The awarding committees have determined to have full and exhaustive tests made of all machinery in competitive exhibition, by the juries of the different departments, and to publish these tests and the jury findings, at the close of the exposition, under the authority of the national commission.

I regret that it is impossible at this time to present figures and definite information as to the prospects and scope of the department. It is yet sixteen months before the opening of the exposition, and while an amount of space in the department building has already been applied for in excess of the total amount available, yet we have heard from fewer than one half of the probable applicants for space. A delicate task is before the department therefore, and it will not be advisable to discuss the question in detail for some months to come, when I hope to have heard from all the electrical people. I will then be in a position to discuss the matter more fully, and more in detail in a paper which I shall ask to present.

The Crystal Palace Electrical Exhiblion.

Engineering, referring to the present electrical exhibition at the Crystal Palace, London, says that in the spring of 1882 the British public had its first opportunity of seeing a thoroughly good collection of electric light apparatus, and showed its appreciation by crowding the Crystal Palace for months. That was the golden age of electricity—from the Stock Exchange point of view—and everyone with a patent to sell or money to invest was to be found at Sydenham on the lookout for information that could be turned to good account. Those who had neither patents nor money to dispose of went to criticise and admire, to the great benefit of the finances of the Crystal Palace Company, who found the show so attractive that they proposed to repeat it in the winter of 1882. They discovered, however, that the electric firms were then working under different conditions, and did not foresee a proportionate reward for a second outlay, and so the proposal fell flat. To add interest to the show the gas interests were asked to appear in friendly rivalry, but the result was not very brilliant. The second exhibition did not attract the public. Now, after an interval of ten years, the Crystal Palace Company have again filled their unrivaled building with electric exhibits, which to-morrow (Jan. 9) will be thrown open to the public, under auspices which justify the belief that the success of 1882 will be repeated.

How little did the sanguine inventor of 1882 realize the difficulties before him. He had the dynamo, the mains, and the incandescent lamp; the public was subscribing money freely, and everything seemed favorable. It was so easy—to all appearance—to erect a central station, fill it with engines and dynamos, lay the mains to consumers' premises, and make large dividends. Yet eight years passed before public incandescent lighting of any account was done, and as for the large dividends—they have not appeared yet.

It is usual to impute the blame of this delay to the Electric Lighting Act (1882), and no doubt that piece of legislation was most effectual in closing the pockets of the investing public, who saw clearly enough that it was impossible for a business with only twenty-one years' concession to repay its promoters. But quite apart from legislation there were causes at work in opposition to the rapid spread of electric lighting. The lesson of the Exhibition was to be read, like the meaning of some

experts' reports, between the lines. The attention of far-seeing business men was concentrated on the articles which were noticeable by their absence. With the exception of Edison's no firm, we believe, showed a complete system of distribution, and his did not commend itself to English opinion. Apart from his display it was impossible to find a comprehensive example of electric distribution. Even taking the promises of manufacturers at their own valuation, it was evident that any company that attempted the lighting of a district of London half a mile square would have to spend a good deal of money in experiments, the results of which would be shared by others, and most of all by the manufacturers who had carried them out. Such a proceeding must, of necessity, be a bad beginning, for it would water the capital and consequently reduce the rate of interest. Simple as the dynamo is, in some respects, its evolution has cost immense sums.

At the present Exhibition the most noticeable feature is the great variety of means for the distribution and use of electricity. The contrast between 1892 and 1882 is more marked in this respect than in any other. At the earlier date there was not a single Swan lamp shown until the Exhibition had been open for weeks; now there is a wonderful screen of 5,000 lamps which is sure to be the talk and admiration of London. It cuts off the end of the nave, not by an opaque grating, but by a curtain of light studded with gleaming incandescent stars, which occupy the entire width, and climb to the airy arch which spans the structure. This dazzling sheet of fire constitutes a fitting trophy on which to emblazon the names of Swan, Edison, Lane-Fox, Maxim, and other investigators, who, ten years ago, were groping towards a lamp capable of commercial use. Less grand, but not less beautiful, will be many of the displays of incandescent lamps among domestic surroundings, illustrating interiors furnished with luxury and taste. At the first Exhibition there were plenty of fittings by such makers as Verity, Faraday, and Defries, but very few of them harmonized with the surroundings of a refined household. It took a long time to learn how to treat the holder of an incandescent lamp. The taste of our metal workers had suffered in the manufacture of the brazen monstrosities which often do duty in gas lighting, and it took some time to free it from the trammels that use had woven around it. Now matters are greatly altered, but yet for years to come there will be plenty of openings for the introduction of dainty lamp holders. The present Exhibition will give an impetus to their manufacture, for many people who have hitherto regarded the electric light with a cold suspicion will be captivated by the appearance of the range of rooms in the gallery, and will seek to obtain a similar effect in their homes. In a dull and gloomy climate, like that of a London winter and early spring, every source of decoration and brightness is eagerly sought after; flowers, ferns, gilding, china, glass, and draperies, are all laid under contribution to embelish the houses of the wealthy, and now another resource has become available to those who have the ability to use it. Lamps and shaded candles have long been a recognized device of the skillful hostess who seeks to render her rooms attractive, but their employment is rigorously curtailed by the danger of fire which attends it. Those who have felt this limitation most keenly will best appreciate the possibilities opened to them by the large and varied display of furnished rooms at the Palace.

The crowning device for the distribution of electricity—the transformer—was not to be seen at the 1882 Exhibition. It was not till the spring of the next year that it was shown, although, as pointed out at the time, it had already been anticipated by a patent of Jablochkoff's. For practical purposes, however, it was a complete novelty, and except from ourselves, it met with the hostile reception which is usually awarded to intruders. In a short time, however, its true value was recognized, and it was by its aid that the first central station for incandescent lighting was opened in London. To-day hundreds of thousands of lamps are fed through transformers, and it is not easy to see how electricity could be carried into suburbs and country towns without its aid. When a perfectly satisfactory alternate current motor is brought out to accompany the transformer, its sphere of action will be still further extended.

Very prominent among the newcomers at the Exhibition is the so-called electrical engineer whose business is confined to the wiring of the houses. He is the natural product of the supply companies, and plays jackal to their lion. He canvasses all the householders in their district, discourses to them both orally and by circular of the advantages of the new illuminant, quotes Mr. Preece, to show that it is "the poor man's light" and will cost no more than gas, and finally offers to lay the wires at prices that the large manufacturing companies declare spell ruin. He seems to thrive, however, and fulfills a very useful part. Generally he was a decorator before he bloomed into an electrician, and knows how to deal with householders, studying their weaknesses as far as possible, and revenging himself for their unreasonableness by sending his men off to another job as soon as he has reduced their home to a chaotic condition. He displays to the full the commercial instinct which is so deplorably lacking in the junior officials of more important firms, and if his tenders are low the "extras" generally redress any injustice he may have done himself.

The display of gas engines is very extensive; we believe it is the largest and most varied ever seen in this country. The steam engine builders have reaped a splendid harvest out of electric lighting—probably greater than the electric companies—and it is evident that the gas engineers are desirous of sharing it with them. There are proposals afloat in some places for combining the gas and electric interests by the use of gas motors for driving dynamos, and these have no doubt done much to quicken the competition. On the face of it there is an alluring prospect in the idea of a small central station equipped with its own producer and holder. The fuel consumption, when working with Dowson gas, has been proved by Messrs. Crossley to be equal to little more than a pound of anthracite coal per horse power hour. At present the hourly consumption of coal per horse power of electric energy delivered to the consumers from supply stations is put down by Mr. Crompton at 5½ lb. per hour in the winter, and by some other engineers at a much larger figure. Much of this is wasted in banked fires and in imperfect combustion when boilers have to be forced. Added to its cost is the expense of idle stokers kept in readiness to meet the requirements of a sudden fog or an unexpected demand. In a gas-driven station the holder would smooth a host of difficulties which now wear the soul of the engineer. Fogs would cease to be a terror, and overtime would disappear from the pay-sheet of the stokers. The business would settle down into orderly ways, instead of being a succession of spasms. So far, however, makers of gas engines have not been able to fullfil satisfactorily the conditions required in even a small station, and it cannot be said that they are within sight of doing so. The new firms who have entered the industry the last year or two have all adopted the prudent course of following the lead of Messrs. Crossley Brothers very closely, and new designs have been infrequent.

Did the Ammonia Gas Take Fire.

The *American Exchange*, in propounding this question, says that more or less the manufacture of artificial ice has changed from a hydrocarbon fire risk to a nitro-hydrogen explosion risk. In other words, there has been substitution of the vaporization in cooling process of ammonia, gas and liquid, for that of the coal tar products. With either subject of vaporization there may be explosion, arising from the tremendous mechanical force of vaporization under high pressure. But the hydrocarbons add to the merely mechanical reaction, in the case of ammonia, the destructive expansion arising from instantaneous combustion. In the ammonia as combination of nitrogen and hydrogen (NH_3) the inflammable hydrogen is suppressed by the inert nitrogen; yet ammonia is exceptionally oxidizable and inflammable. While generally ammonia is to be classed as a non-supporter of combustion, as suffocative of flame, a very thin stream of it passing into the air may become ignited and burn with a pale-blue flame (hydrogenous).

A fire outburst at a Philadelphia brewery, Dec. 10, presents in its record some significant suggestions upon this subject—vapor issuing from a compressing cylinder taking fire from an uncovered gas light. The Philadelphia Fire Underwriters' Association reports and infers that "the fire was caused by the breaking of a tubular glass gauge connected with a compressing cylinder containing ammonia gas. In these cylinders a quantity of paraffine oil is deposited. The explosion or escape of the ammonia gas through this aperture caused a spraying of this oil through the air and over the woodwork of the room, which was ignited by an open gas light in the room." With the exuding of the gas mechanical explosion was averted, and, consequently, the conditions exclude the idea of ammonia explosion. If there were no explosion, however, there certainly was fire, and the report named states that "the fire originated in the ice machine house, a two-story building, resulting in extensive damage to the interior woodwork of this part, and some damage to the machinery contained therein. The fire extended to the ice house, a five-story building adjoining, doing considerable damage to the upper floors and contents."

As the report attributes the fire to the ignition of drops of paraffine oil spreading before the fire through the air, the spraying would, in such event, be the effect of a feeble explosion of something. The paraffines, as their name indicates, are not chemically active, and they are of less volatility than ammonia. The ammonia gas passing through the air would come in contact with the gas flame before any possible vapor of the volatile paraffine. Manifestly it did not extinguish the flame. With

the air sufficiently dense with hydrocarbon vapor, there would have been an instantaneous combustive explosion without any spraying of the oil. In the air ammonia is freely combustive—*i. e.*, not explosively so—when it can be ignited; and favoring the possibility of such ignition was the egress from the aperture in whatever manner it could pass out through an *opening* in a *glass* tube. A possible hydrocarbon explosion before the fire broke out not being within the conditions of the case any more than an impossible ammonia combustive explosion after the fire broke out, the indications are that the gas light ignited a small volume of ammonia gas, and such ignition was followed by the ignition of paraffine vapor, whence the perhaps somewhat violent spreading of the flame.

As such origin of a fire is much of a curiosity, and a glass tube a novelty as an incendiary, we conclude with this brief citation from the report referred to: "The glass gauge in the room was close to a temporary wooden wall (erected during alterations), which admitted the cold air, and the variation in temperature to which the gauge was exposed no doubt caused the breaking."

Adjustable Control of Gas Lights in Churches.

The *Engineering Record*, in calling attention to a system devised by Mr. Paul S. Bolger, of this city, for the convenient controlling of the lighting of churches by gas, remarks that in many churches, especially cathedrals and city churches, it is desirable to quickly and definitely vary the intensity of the gas light in different sections of the building at different periods of the service. This regulation should be done easily

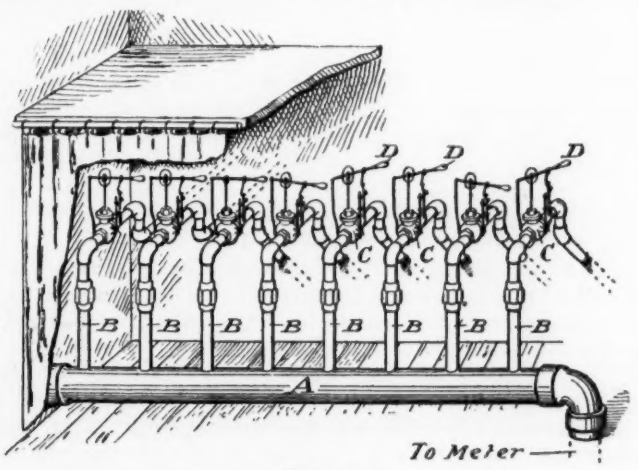

Fig. 1.

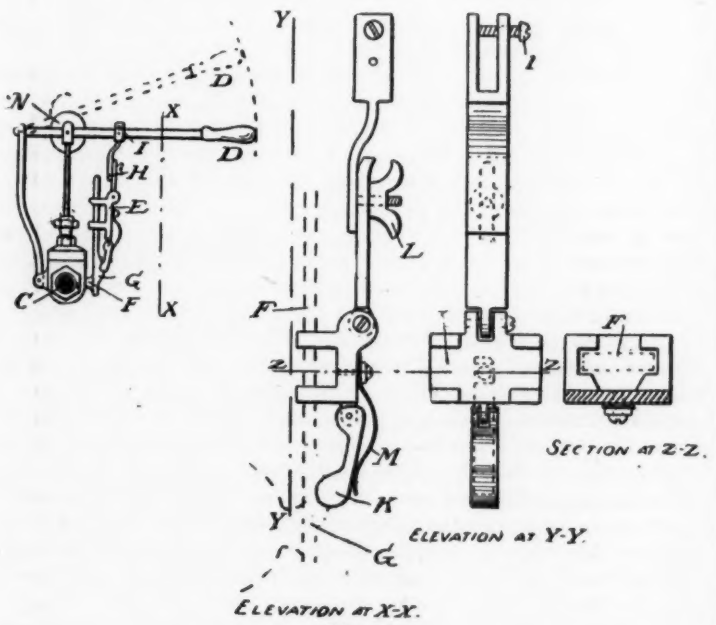

Fig. 2.

and certainly from one place, and should avoid danger of entirely extinguishing the lights, or any lack of uniformity. An arrangement devised to accomplish this has just been applied to the gas system in the Church of the Holy Trinity, 42d street, New York city, and operates as shown in the accompanying illustrations. The 4-inch gas main *A* (Fig. 1) terminates on the floor of the auditorium in a corner near the rear, and into it are tapped the 1¼-inch branches *B B*, etc., which each supply all the group of lights in a particular part of the edifice, as the nave, the transept, the chancel, the right gallery, left gallery, etc. Each of these branches is controlled by an ordinary gate valve *C*, operated by a hand lever *D*, so that the sexton may from this point graduate any set of lights at will. Fig. 2 is a side view of a valve *C* showing an attachment *E* intended to fix the opening of the gate at one or more exact positions, thus producing several unvarying intensities of illumination, or to allow it to be entirely closed when necessary. A guide bar *F* is screwed rigidly to the valve and has one or more rounded seats *G*, which engage with a spur, *K*, attached to the adjustable bar *H*, which is fixed at *I* to any part of the valve lever and slides over bar *F*. When handle *D* is depressed from D^1 (the full open position), spur *K* slides easily along down on *F* until in the position shown, it rides over into the seat *G* which is curved so as to offer some resistance to slipping. The lever is thus held at *D* as shown, unless the force is noticeably increased to push it down, when *K* leaves its seat *G* with a distinct click, and may be pushed successively into other similar seats (not shown here), or the handle *D* may be completely depressed and the lights shut off altogether. *M* is a steel spring maintaining spur *K* in contact with guide *F*. *L* is a set screw for adjusting the stops to any position of the valve lever, and *N* is a set screw for the direct adjustment of the gate stem. This arrangement has been in operation for several months, and is considered convenient and effectual.

An Interesting Experiment with Steel.

Mr. Charles Wetterer, of this city, in a communication to the *American Machinist*, says it appears that the idea that steel is a chemical combination of iron and carbon is universal; but where is the proof? When two elements combine chemically the nature of both changes; this does not happen when iron is carbonized, but a change does take place; the pulverulent carbon melts. Well, it will be said carbon has never been melted. Be pleased to hear my explanation. The atoms of carbon buried in molten iron are in a very different position, for instance, from that of electric light carbons; it does appear that the fact that the iron is molten has a greater effect on the carbon than the temperature itself. To this action we have a parallel in ordinary illuminating gas, concerning which a prominent work on chemistry says: "The light and gaseous hydrogen possesses in a great degree the power of rendering other bodies aeriform, on uniting with them, even those which are not volatile, just as an eloquent speaker can communicate his enthusiasm to an indifferent audience."

To prove this idea I have succeeded in crystallizing carbon taken from steel wire nails, iron cut nails and steel filings, by dissolving them in acids. It is, however, a difficult thing to do, the chief obstacle being that about 98 per cent. of iron must be dissolved in order to obtain about 2 per cent. of carbon. If the dissolution of the iron is violent, the gases generated carry the nascent carbon to the surface, where it is oxided by the oxygen in the air, causing small explosions that are easily perceived in sunlight; to this nascent state of the carbon its power to crystallize is due. If the action is less violent, or the carbon artificially obstructed, that which is so obtained resembles lamp-black; sometimes a body of the same consistency is formed, but it is white.

My first experiment was to dissolve a small quantity of steel filings in about a teaspoonful of acid, which resulted in a few small crystals, but, nevertheless, larger than the grains of steel; by pressing these crystals into my thumb nail and drawing them across glass, they cut or scratched, as only diamonds can. The result of the past six months of experimenting is small, but sufficient, I think, to establish my theory.

It may be mentioned here, in support of this argument, that diamonds on being placed in the electric arc, melt, oxidize and disappear like a flash; carbon in steel, on being burnt, behaves in the same manner, which would indicate not alone the separate existence of carbon, but that it is molten.

It appears to me as reasonable that when steel is heated, the atoms of carbon have a tendency to unite, and form comparatively large particles; when slowly cooled, these particles remain large, but on being chilled the molten particles are shattered to atoms; in this way the surface area of diamond presented to iron may easily be increased from 10 to 100 times. With this increased surface contact, and the more thorough diffusion, it is not difficult to understand why steel should harden on being chilled. It is also possible that the different conductivity of carbon and iron, and electric currents set up in the chilling metal, have their influence on the arrangement of the atoms, and, possibly, on the degree of hardness or tenacity; by drawing temper the atomic diamonds

begin to gather and rearrange slowly, until the proper degree of hardness or size and arrangement of diamond particles is shown by the color, when further progress is arrested by quenching.

Producing Cyanogen from Gas.

Mr. W. Leybold, in the *Chemical Trade Journal*, says that the coal employed for the manufacture of gas usually contains about 1.2 per cent. of nitrogen, more than half of which is completely lost; it is found that 100 parts of nitrogen contained in the coal are distributed as follows among the products of distillation:

Coke	31.36	per cent.
Ammonia	10.14	"
Ferrocyanide	1.50	"
Tar	1.08	"
Deficit	55.92	"

The missing nitrogen is in the gaseous state, mixed with the illuminating gas, which may contain as much as 3.5 per cent. of it when it has been made at a very high temperature. Now, this loss is not without importance, for nitrogen is worth about seven times as much in ferrocyanide as in ammonia. The cyanogen in the crude gas owes its origin to ammonia. When an indifferent gas, such as hydrogen, is mixed with ammonia and passed over red hot coke, the presence of cyanogen—absorbable by dilute caustic potash—can be detected in the resulting gas; simultaneously with this the ammonia is decomposed into nitrogen and hydrogen, so that when the amount of ammonia passed through is small, hydrocyanic acid and not ammonia cyanide is found. With a sufficiently slow current of air, and a high temperature, about 0.5 to 0.8 per cent. of the ammonia employed can be converted into cyanogen. In practice, this transformation should be more complete, because the contact of the ammonia with the coal is more prolonged than in a laboratory experiment. Bunte has actually succeeded in showing that the ratio of nitrogen as cyanogen, to nitrogen as ammonia, may rise to one-third.

In the gas, the cyanogen is chiefly present as ammonium cyanide, but in order to determine the amount, a suitable method of analysis must be found, since the processes usually employed, by means of silver salts, calomel, and the action of palladious chloride and sulphur dioxide on mercury cyanide, are not very satisfactory in the presence of sulphur or tar.

For this purpose the transformation of cyanogen into ferrocyanide in an alkaline solution, in presence of a ferrous salt, has been utilized. A measured volume of the gas is passed into a mixture of caustic soda and ferrous sulphate, dissolved in water, the mixture being contained in the wash bottles, and the ferrous hydrate being in suspension.

After the passage of the gas, sulphide of iron and sodium ferrocyanide are present. The liquid is boiled for a quarter of an hour to complete the transformation into ferrocyanide, filtered, and made up to half a liter.

A fractional part of this solution is treated with ferric chloride, which precipitates Prussian blue. The latter is separated by filtration, treated by caustic soda, the liquid filtered, acidified with sulphuric acid, reduced with zinc, and titrated with permanganate (Moldenhaun and Leybold's method, "Moniteur Scientifique," 1890, 200). The cyanogen is thus completely absorbed, for no ferrocyanide is found in the third wash bottle, and only very little in the second.

The gas leaving the retorts contains ammonium cyanide. A small fraction of this substance in presence of a large excess of ammonium sulphide is converted into sulphocyanide; ammonium cyanide and hydrocyanic acid being able to dissolve iron, a little ferrocyanide is found in passing through the iron pipes.

In the condensers very little cyanogen is retained, in spite of the ready solubility of ammonium cyanide; this salt, being decomposed by the carbon dioxide of the gas, is replaced by an almost equivalent quantity of hydrocyanic acid, which escapes condensation.

The following tables show the progressive elimination of cyanogen:

Samples.	HCN in Grms. Per 100 Cubic Meters.		HCN Retained Per Cent.	
	I.	II.	I.	II.
Main	265.9	203.4	5.4	14.57
After the scrubber	251.6	173.6	45.09	—
After 1st purifier	131.7	—	18.20	56.15
After 2d purifier	83.3	59.5	8.16	—
After 3d purifier	61.6	59.5	—	—
In the gasholder	51.2	19.8	15.50	9.73

Ammonia.

	NH_3 in Grms. per Cu. Meter.	NH_3 Retained. Per Cent.
Main	396.6	17.88
After condenser	325.7	81.16
After the tower	3.8	0.96
After the purifier	Traces.	

Sulphureted Hydrogen.

	H_2S in Vols. Per Cent.	H_2S Retained. Per Cent.
Main	1.38	20.29
After condenser	1.10	3.02
After tower	1.05	76.09
After 1st purifier	Traces.	

It will be seen that the proportion of cyanogen retained in the purifiers is 56 per cent. with two, and 71 per cent. with three. Consequently, the greater the number of purifiers the larger the amount of cyanogen collected. It will even be of advantage to employ a very long purifier as the first, which will still be able to act on the gas freed from sulphur; by increasing the dimensions of this first purifier $\frac{8}{10}$ per cent. of Prussian blue may be obtained in the purifying materials.

Experiments with Electric Light on the Growth of Leaf Plants, Tubers, etc.

The following is abstracted from a report made by Professor Bailey on an extensive series of experiments, which were conducted during the winter of 1889-90, at the Cornell University Experimental Station, Ithaca, N. Y., with a view to determining the influence of the electric light on plant life:

A conservatory was divided into two compartments, in one of which plants were treated in the ordinary way, with sunlight by day and darkness during the night. In the other compartment the same class of plants was subjected to sunlight by day and the electric light during the hours of darkness. The conditions of temperature were kept equal in both compartments. The objects of the experiments were to note the effect which the electric light might have by supplementing it during the hours of darkness on the growth of plants.

The house was low, as to the ceiling, with a flat roof, and 20 × 60 in area, divided by a tight board partition and warmed by steam. In the part where the electric light was used, the lamps were hung low—2½ feet above the soil in which the plants were grown.

The general effect of the light was to greatly hasten the growth and maturity of most of the leaf plants. Those plants nearest the lights grew more rapidly than those a few feet farther away. This tendency was particularly marked in leaf plants, such as spinach, cress and lettuce; but the plants tended to "run to seed" before the edible leaves were formed. The spinach, under the influence of the electric light, matured and produced good seed, while that in the dark at night was still making large and edible leaves.

The most marked and favorable results were obtained in the growth of lettuce. Three weeks after transplanting, those under the influence of the electric light were fully 50 per cent. in advance of those grown in the dark house. The heads from the electric light were placed on the market two weeks earlier than those grown under the usual conditions.

Radishes showed very unfavorable results, so far as size was concerned; but they were much earlier in maturing. It was found that the electric light exerted a much more favorable influence when it was covered by a thin glass globe than when used naked. It was surmised that this difference arose from the supposed fact that the glass absorbed or obstructed the highly refrangible and invisible rays. The experiments, on the whole, seemed to justify the conclusions that, while the naked electric light has a damaging influence upon the plants near it, electric light promotes assimilation; it often hastens growth and maturity; it is capable of producing natural flavors and colors in fruits; it often intensifies colors of flowers, and sometimes increases the production of flowers, and that periods of darkness are not necessary to the growth and development of plants. Professor Bailey believes it is only necessary to overcome the difficulties, the chief of which are the injurious influences upon plants near the light; the too rapid hastening of maturity in some; and, in short, the whole series of practical adjustments of conditions to individual circumstances to render electro-horticulture a success. Deherain, a French experimenter, says that the injurious rays from the electric light are greatly modified by a transparent glass. Professor Bailey's experiments with an electric lamp, protected by an ordinary white opal globe, gave results much less marked than that of the naked light; in a word, the injurious effects were lessened by the use of the globe.

Some of the experiments show that injury follows the use of electricity when that light is used at a critical time, as, for instance, when the young plant is losing its support from the seed and is beginning to shift for itself. The best results seem to follow the later use of electric light. On the whole, the opinion is expressed by Prof. Bailey that there is a future for electro-horticulture, when all the conditions of treatment are fully understood. Further experiments will be made and reported upon as soon as the results are reached.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

CHICAGO is not satisfied with a single gas inspector. The demand there now is for a board of gas inspectors!

THE recent great rise in the Alabama river has caused much loss in the territory adjacent to Montgomery, Ala. Among the flooded out can be counted the Montgomery Gas Light Company, which works were shut down for two days because of the encroaching waters.

THE Berlin Iron Bridge Company, of East Berlin, Conn., is completing a new machine shop for the Bridgeport (Conn.) Machine Tool Company. The structure, which is divided into two parts, each 40 feet in width, is built entirely of brick and iron. The total length of the structure is 90 feet. One section is two stories high, the roof and floor being designed for light work, while the opposite half of the building is of the same height, but the second floor is omitted so that it may be used as an erecting shop. The erecting shop is controlled by a traveling crane. The building when completed will be one of the most perfect and best designed machine shops in the New England States.

SOME time ago the New Britain (Conn.) Gas Light Company erected a new gasholder, which, when finished, was promptly valued by the local board of assessors at $20,000. President Landers, of the Company, thereupon appealed to the board for a re-rating, urging that the new holder was really an insurance against the collapse of the old holder, which, although weak and not very serviceable at the best, was still kept at the valuation put upon it by the assessors when the holder was new and serviceable. Mr. Landers was successful in his appeal in that the board ordered a substantial reduction to be made in the valuation.

"OBSERVER" forwards the following: "At the Thirty-ninth annual meeting of the Newport (R. I.) Gas Light Company the shareholders re-elected the following officers: Directors, Henry Bull, Philip Rider, James C. Swan, Thos. A. Lawton, William H. Fludder and Andrew K. Quinn; President, Henry Bull; Secretary, Thomas A. Lawton; Treasurer, Andrew K. Quinn. The annual report of the President showed that the increase of business had rendered many of the old pipe lines too small for the work demanded of them, and that in consequence the service in some sections had not been what it would have been had the mains been of greater diameters. To obviate this the Company put down during the past year 1,800 feet of 16 inch main, replacing one of 6 inches in diameter from the works to Bellevue auenue; 1,200 feet of 12 inch main in Broadway, replacing one of 4 inches; 640 feet of 8 inch pipe in Bellevue avenue, replacing one of 4 inch; and about 1,200 feet of 4 inch main, in various parts of the city, replacing 2 inch pipe. The sale of gas during the past year shows an increase of about 10 per cent. over that of 1890, and the increased use of gas as a heating and cooking fuel is even greater, about 175 new stoves, etc., having been put in during the year, making between 600 and 700 in use in Newport. The question of water gas appears to have dropped from public notice, as nothing is now heard of it. Though the Company has a water gas plant it often happens that it is not used once during an entire month, and it is generally when this plant is idle and only coal gas is being supplied that some one is found who thinks the odor of water gas is discernible in his or her house."

THE Stoneham Lumber Company, Stoneham, Mass., wants to dispose of a 4 horse power Otto gas engine. It is said to be in perfect order. The owners dispose of it for the reason that their business requires a large increase in the motor power necessary to operate the works.

AT the annual meeting of the New Albany (Ind.) Gas Light and Coke Company the following officers were chosen: Directors, W. S. Culbertson, George H. Derol, J. K. Woodward, Sr., J. K. Woodward, Jr., and Jas. W. Dunbar; President, W. S. Culbertson; Secretary and Treasurer, J. K. Woodward, Jr.; Superintendent, J. W. Dunbar; Cashier, Jas. O. English.

"CONTRACT or no contract, you must pay for what is gotten," is the burden of the judgment of the English Court of Appeals, in a recent case of equal interest to owners and workmen, whether of mines of coal, of iron, of shale or of fireclay, and of interest as well to those who operate such properties in this country. Some coal miners and their employers, both parties being members of the Monmouthshire and South Wales Collieries Association, under the regulations of which the wages of the workmen were arranged by a sliding scale, had contracted that the men should be paid wages of 37 cents per ton for large coal, with an addition of 32½ per cent. as fixed by the sliding scale. The men were only employed to raise large coal, and when it was weighed and screened small coal was found in it and separated, and the men were paid for the large according to the contract, and the employers duly performed their part of the contract. So far the men had no complaint, but they said, and with success, before the County Court and before the Divisional Court, and finally before the Court of Appeals, that inasmuch as the Coal Mines Regulation Act, 1887, provided "that where the amount of wages depended on the amount of mineral gotten by the men, they shall be paid according to the actual weight of mineral gotten by them of the mineral contracted to be gotten," they were by the Act of Parliament entitled to be paid for the small coal "got" by them as well as for the "large," no matter what they had contracted. The Court further gave them the same price for the small coal as the large, on the ground that when it was "got" by the workmen one was originally part of the other, and that small coal and large coal were equally "coal," and that was the mineral contracted to be gotten.

THE proprietors of the Seymour (Ind.) Gas Company have reduced the selling rate to $1.75 per 1,000 cubic feet, a concession of 25 cents.

AT the annual meeting of the Chicago Gas Light and Coke Company Mr. W. H. Gebhard resigned from the Company's Directory, and the following officers were chosen: Directors, E. J. Jerzmanowski, Walton Ferguson, W. J. Campbell, J. B. Cohrs, C. E. Judson, C. K. G. Billings, G. O. Knapp, C. K. Wooster, E. C. Benedict, F. S. Winston and A. M. Brady—the last-named replaces Mr. Gebhard; President, E. J. Jerzmanowski; First Vice-President, C. K. G. Billings; Second Vice-President, G. O. Knapp; Secretary and Treasurer, C. K. Wooster; Assistant Secretary, C. F. Bryant; Assistant Treasurer, L. A. Wiley.

WRITING of the above reminds us that the statement of the Chicago Gas Company for December shows net earnings of $279,082, an increase of $74,790, as compared with December, 1890. After deducting the amount ($12,500) paid the city under the recent agreement the increase in net is $62,290. The net earnings are computed after payment of interest on bonds and all charges except dividends on the certificates.

ACCORDING to a recent issue of the Boston *Advertiser* City Engineer Jackson and Captain B. S. Flanders have been for some time engaged in investigating the cost of an electric light plant for the city of Boston. Mayor Matthews believes that by the city owning its own plant, lights can be furnished at a lower cost than 40 cents per light that it now pays. When Mayor Hart was elected the city was paying 65 cents a light per night, and when those contracts expired he objected to paying over 40 cents. The electric light companies for a time refused to come to the Mayor's figures, claiming that 40 cents was less than the actual cost. As they were unable to force the Mayor to recede from his position they finally agreed to his terms. The saving to the city the first year of the reduction amounted to $112,000, and as the number of lights has since been nearly doubled, the saving for the present year is about $200,000. The electric light companies are still making money, so it appears that 40 cents is a profitable figure. Mayor Matthews is seeking to still further reduce the cost, and as soon as the result of the investigations now in progress is received by him he will send a communication to the City Council recommending that some action be taken in the matter. The agitation will probably result in another reduction by the electric light companies.

IN the meantime, and while Engineer Jackson and Mayor Matthews are squinting in the direction of embarking the city in municipal electric lighting, it is well to note the fact that cities that have been "progressive" enough to try the scheme are not wildly enthusiastic over the success of such ventures. Everybody in the lighting business has heard of the municipal arc lighting plant at Little Rock, Ark., and at how cheap a figure the city was obtaining its public lamps—something like 10 cents each per night, we believe was once claimed. However, it seems that such is not the case at present, and, in fact, it appears that it never was the case—errors were made in the calculation, and so on. The truth is that Little Rock is in a quandary. It has a good many

thousands of dollars invested in an arc lighting plant, but the plant, which at the outset it was said would light the city completely, is not within 50 per cent, of the lighting requirements of the city, and it is fast going to rack—so that the cost per arc per night would be at a low figure. These remarks are based on a discussion that recently was had in the Little Rock City Council, which came about by a report from Superintendent Fisk, who claimed that the city was in urgent need of 50 more arcs. The Superintendent believed that take it all in all the plant enlargement and repair necessary to effect this would cost about $25,000, but he also believed it would be a wise move on the part of the city, as the lights now maintained cost on an average $119.83 per year, as against "an average cost per lamp, in 527 cities, in 33 States, of $145.58 per lamp." The Superintendent, however, forgot to say that not long since, in reply to an inquiry from Mr. Wall, of the Badger Illuminating Company of Milwaukee, he put himself on record in the statement that the cost to Little Rock for each arc light maintained was $81.00 per annum; "depreciation and interest not figured." Truly, the Little Rock men little reck of the figures they put out at divers times.

Some time ago the proprietors of the Stratford (Can.) Gas Company purchased the property of the local Reliance Electric Light Company, and now asks the city to take it off its hands. The Gas Company suggests that if the city purchases the same it will have entire control of the public lighting by electricity.

A few days ago the Tiffin (O.) Gas Company's works were slightly damaged by an explosion.

Mr. David Scannell, Chief Engineer of the San Francisco Fire Department, recently gave notice that, at the expiration of 10 days from the publication of the notice he would cut all electric light wires or any wire used to conduct electricity, or an electric current for the purpose of producing electric light or motive power, found stretched over or across or upon the top or roof of any building within the city and county of San Francisco.

Mr. Symington, General Superintendent of Lamps, Baltimore, Md., recommends in his last annual report that the inspection of gas meters be made a separate department. He estimates that the revenue from these inspections, which amounts to $2,000 per annum, would pay the expenses of the proposed office.

A communication was recently forwarded to the City Council by the Rochester Gas Company, which called attention to the fact that the present rate of 5 cents per lamp per night was made some years ago on the basis of a contract for upwards of 2,000 lamps compactly located. Since that time the adoption of other means for street lighting had reduced the number to about 500, most of which were in isolated localities, which change greatly increases the cost of the care and the maintenance of the lamps. In view of this a new scale of prices, to take effect on the first prox., was submitted. It is as follows: For more than 500 and less than 600 lamps, 6 cents per lamp per night, for more than 400 and less than 500 lamps, 6½ cents per lamp per night; for more than 300 and less than 400 lamps, 7 cents per lamp per night; for more than 200 and less than 300 lamps, 7½ cents per lamp per night; for more than 100 and less than 200 lamps, 8¼ cents per lamp per night.

Despite the wretched weather for the past week or so, the annual meeting of the American Society of Civil Engineers, held in this city on the 20th and 21st inst., was a thorough success. The interest was well sustained and the outing time and paper list were much enjoyed. Engineers are by no means fair-weather birds. The attendance was large and representative.

At the annual meeting of the Dover (N. H.) Gas Company, the following Directors were chosen: Amos Paul, Thomas B. Garland, Eli V. Brewster, John Holland and Charles H. Sawyer.

It is said that Mr. Franklin Haven will occupy the place on the Directory of the Boston Gas Light Company made vacant by the death of Mr. H. C. Gibson.

Although the contracts under which the arc electric lighting of Detroit is being performed do not expire until July 1, 1893, Mayor Pingree advises the City Council to pass an ordinance for the establishment and operation of an electric lighting plant on municipal account.

The burners in the public gas lamps of Philadelphia are rated to burn a maximum of 8 cubic feet or a minimum of 6 cubic feet per hour.

According to the report of the Secretary (Mr. John C. Trautwine), read at the annual meeting of the Engineers' Club, of Philadelphia, we learn that the average attendance at the meetings during the past year showed a marked increase. This increase, which amounted to almost 100 per cent., is attributed in great part to the policy inaugurated last year of printing and distributing amongst the members advance copies of the papers to be read. Four numbers of the "Proceedings" were issued during the year by the Publication Committee of the present Board, and a fifth early in January of 1892. Important improvements were made on the Club House, including the installation of a telephone. Forty-seven active and three associate members were presented and accepted during the year, bringing the total membership of all classes at the end of the year to 421. Over $300 were subscribed to the fund for establishing an engineering headquarters and Engineering Congress at the World's Fair. At the annual meeting 23 active members and 1 associate member were added to the rolls. Mr. Jas. Christie was elected President for the current year, and Mr. John C. Trautwine, Jr., was re-elected Secretary.

The annual meeting of the Springfield (O.) Gas Light and Coke Company was held on the 11th inst., and the stockholders elected the following Board of Directors: A. S. Bushnell, B. H. Warder, John H. Thomas, Ross Mitchell and J. W. R. Cline. At the Directors' meeting the following organization was perfected: President, General A. S. Bushnell; Secretary and Superintendent, Captain J. W. R. Cline. The report of the Secretary showed that the business of the Company had increased considerably during the year. This action of the Directors will be noted as a promotion for Captain Cline, whose clever business methods have not only found favor with the Company, but with the community as well.

The Fort Scott (Kansas) Gas and Fuel Company, purveyors of fuel gas in that city, seem to be in a bad way. The principal or leading cause of their seeming indisposition is the energetic action of Superintendent R. M. Searles, of the old Fort Scott Gas Company.

We are indebted to a correspondent for the following from Detroit, Mich., under date of the 15th inst.: "The first of a series of damage suits against the Michigan Gas Company, of Detroit, was commenced yesterday. On the 2d of December the supply of natural gas by the Company was suddenly shut off at 2 o'clock A.M., and at 2:10 the supply was renewed. As this intermission was made without the knowledge of the consumers a number of narrow escapes from death by asphyxiation were reported. Mrs. Sarah Ladd, of Jones and First streets, was one of those affected, and she is the complainant in the case under mention, the damages being put at $15,000. Complainant represents that on the night preceding December 2d she retired to bed, leaving the gas in the furnace heater burning as usual, but that subsequently, through the carelessness of the Company's employees, the gas was turned off in the mains, extinguishing the furnace fire, and that the supply of gas was re-established, the cut-off being made without notification and the resumption without warning. The dangerous vapor filled the house, and was inhaled by the plaintiff for some hours. In consequence she has been ill ever since, and her Doctor certifies that she has suffered permanent injuries to her heart, lungs and throat. She asserts that the Company under its agreement contracted to supply her gas for maintaining a continuous system of house heating, the supply, as to its intermission or control, to be under her manipulation. Following this outline of Mrs. Ladd's complaint and that which she urges in support of it, I forward the following gossip that is the outcome it. Mr. P. Blake said that the Natural Gas Consumers Association had nothing to do with the suit brought by Mrs. Ladd, as she was not a member of the Association; but he (Mr. Blake) added that several similar suits were to be brought shortly by parties who were members of the Association. At one of the 'indignation meetings' held by the Association, a Mr. Frazer said that each person taking gas from the Company was required to sign an agreement releasing the Company from all damages or loss resulting from accident through the use of imperfect appliances. One of the latter is an automatic shut-off furnished to the consumers by the Natural Gas Construction Company, which is practically identical with the Michigan Gas Company. When the gas was shut off on Dec. 2, these automatic shut offs, it is alleged, failed to work. It may be thus foreshadowed that the Michigan Gas Company, in contesting these suits, will plead 'defective shut offs,' and I opine that this will be but a poor staff to lean upon before a jury. Secretary Byrne, of the Consumers Association, while admitting that the clause in the contracts releasing the Company from damages was somewhat broad, he did not think it

would cover a case where the accident was plainly caused by the negligence of the Company. In this I agree completely; and speaking for myself, were I an officer of the Company I would try to compromise these suits instead of defending them.—TAYLOR."

IT is said that an attempt is underway to secure control of all the electric plants in the section between Elizabeth and Plainfield, N. J., with the view of operating the same as one enterprise. Rumor also credits the Plainfield Gas Company as being prominently identified with the scheme, but this we are inclined to doubt.

THE law committee of Atlantic City (N. J.) Councils has instructed City Solicitor Endicott to institute proceedings against the Camden & Atlantic Railroad, which operates a surface railroad on Atlantic avenue (from the Excursion House to the Inlet) to eject it from the avenue, unless it agrees to light the street by means of electricity. The road is operated under the single trolley plan, and is a very profitable piece of property.

SOME months ago (as reported at the time in the JOURNAL) the residents of Savin Hill, Dorchester District of Boston, entered a complaint before the Board of Health, urging that offensive and unhealthy odors were caused in the district through defects in the Bay State Company's system of manufacturing gas at its Commercial Point Station. The owners of yachts anchored in Dorchester Bay also complained that the drainage from the Company's works so fouled the water as to cause great injury to the bottoms of the vessels and to the paint on their surfaces. After several hearings the Board of Health ordered the Company to abate the cause of the complaints, failing which the City Solicitor was instructed to apply to the Supreme Court for an injunction restraining the Company from operating its works at Dorchester. The Company at once busied itself in remedying the evil, and now comes before the Board of Health with proof that, after an expenditure of $20,000, it has successfully coped with the matters complained of. The Health Board having scrutinized the proof, practically accepts and confirms the same through the passing of an order requesting the City Solicitor to take no further steps in the premises.

WRITING of this brings to mind a condition of affairs on the Gowanus Canal, in Brooklyn, which is in no sense creditable to the proprietors of the Fulton Municipal Gas Company of that city. The sluggish waters of this ever fetid stream—it can easily discount the Chicago river as a sinkhole—are bad enough at best, but the Fulton-Municipal Company is doing its portion towards inflaming putridity. In fact, its drainage covers the entire surface of the Canal, from a point at Douglas street on the north to Carroll street on the south, with an ill-smelling residuum of oil that would cause a pretty hot fire, were it ignited. Perhaps no one is more alive to the situation and its possibilities than is the Superintendent, Mr. Jourdan, but the proprietors seems to have little regard for anything other than present dividends. A few thousand dollars expended in preparing for the annihilation of the nuisance would be money well-spent, for the Board of Health will certainly in the near future have its attention directed particularly to the conditions existing at this point.

AT the annual meeting of the Newburyport (Mass.) Gas and Electric Light Company the following Directors were chosen: E. F. Stone, W. A. Swasy, Eben Sumner, L. B. Cushing, T. C. Simpson, Wm. R. Johnson and Alfred A. Reed. The Directors then named the following officers: President, E. F. Stone; Treasurer and Clerk, D. D. Tilton; Auditor, W. E. Chase.

THE proprietors of the Gloucester (Mass.) Company have been awarded a dividend of 3 per cent., out of the earnings for the past 6 months.

No change has been made within recent date in the management of the Standard Company, of this city.

AT the annual meeting of the Peoples Gas Light Company, of Cleveland, Ohio, the following officers were elected: Directors, G. H. Warmington, M. A. Hanna, Charles McNeil, R. R. Rhodes and Belden Seymour, Jr. President, George H. Warmington; Secretary and Treasurer, J. M. Carrington; Supt. and Engineer, Daniel R. Warmington.

THE proprietors of the Dover, (N. H.) Gas Company have declared a dividend of $1 per share.

MANAGER FRIEDBURG, of the Consolidated Electric Light and Power Company, of Kansas City, Mo., says that the Company will, on May 1st, adopt a reduced schedule of rates for an incandescent electric lighting service, the rates to be about as follows:

No. Lights.			Price per Light per Month.
One to 3	lamps	per month	75 cents.
Four to 6	"	"	70 "
Seven to 10	"	"	65 "
Eleven to 20	"	"	62 "
Twenty to 40	"	"	60 "

We presume the illuminating value of each lamp is put at 16 candles.

THE following officers were elected by the Trenton (N. J.) City Gas Company at its annual meeting: Directors, John S. Chambers, W. L. Dayton, E. W. Evans, G. S. Grosvenor, Lewis Parker, Isaac F. Richey, N. H. Roberts, Isaac Stephens, and E. M. Yard; President, Lewis Parker; Secretary and Treasurer, John S. Chambers.

INDIANAPOLIS, Ind., is agitating the subject of installing an electric lighting plant to be operated on municipal account.

Chloride of Calcium as a Solvent.

M. Audouin, of the Josse-ten-Noode (Belgium) Gas Company, in a communication to the Belgian Association of Gas Engineers, remarks that the severe winter of 1890–91 drew the particular attention of the gas managers of that country to the apparatus used by them which was capable of being injuriously affected by frost. It was thought that the methods hitherto adopted in order to prevent or minimize the effects of cold were imperfect or too costly, and a substance both cheap and easily applied was tried—namely, chloride of calcium.

This salt placed in contact with ice rapidly causes it to melt; and a solution of it does not freeze at the lowest temperatures met with in our climates. Only the latter property of the chloride has been hitherto utilized; but in consequence of last winter's frosts, we have been led to try on a large scale the dissolving influence of this salt upon ice.

During keen frosts the public lamps are in many cases extinguished. This is due, not to naphthaline in the great majority of cases, but to blocking by plugs of ice. The moisture contained in the gas arriving in the colder lamp pillar is deposited and freezes into slender needles These form a coating, and when this coating attains a certain thickness a shock or a change of temperature loosens it, pieces fall down and cohere, and a plug is thus formed. If the frost be keen and persistent, plugs may even form in the main. In that case the free gasway is continuously diminished by fresh depositions, and ice accumulates so as to diminish the pressure, or even to cause extinction.

These inconveniences have been successfully remedied by the use of a solution of chloride of calcium of 25° to 30° Baume (sp. gr., 1.21 to 1.26). The mode of use is very simple; each man charged with the surveillance of the lighting carries on a shoulder-strap a can and a funnel. To clear a lamp, he unscrews the burner, inserts the funnel, and pours in by successive portions about 3½ ounces, or even less, of the solution.

If the plugging has taken place in the main itself, the liquid is introduced in the same way. The place at which the obstruction has taken place is approximately ascertained by a simple observation of the pressure, and then, the slope of the pipe at the place being known, the liquid is poured in a little above the obstruction. The action is very rapid. Besides this, it has been observed that the street lamps, once cleared in this way, remained clear for a week or a fortnight, whereas formerly they used to become choked every day, or, in many cases, several times in the same evening. This fact can be thus explained: The solution, being syrupy, moistens the walls of the pipe and sticks to them. The moisture arriving may still condense, but ice cannot be formed until the salt has completely disappeared.

As to obstructions in the conduit pipes, it is not possible to state *a priori* the quantities which must be used and the time necessary for clearance, for the circumstances vary with each case; but experience showed that the method was equally efficacious. An example may be quoted from Brussels. A 3-inch pipe, uncovered, traversed an archway 40 inches in diameter. The street being long and sloping, all the moisture condensed along a track of about 1¼ mile ran into a receptacle about 160 yards below this passage. Thirty-five lamps were supplied by this pipe between the archway and the highest point of the street. When the keen frost arrived, the flame of the first lamp diminished, flickered, and finally went out; a little after, the second lamp dwindled and went out also; then the third began; the receptacle was then examined and was found to be in good condition and to contain nothing but a little water. There was therefore some obstruction in the pipe which prevented the condensed water from making its way to the receptacle. The extinction having first taken place in the lamp nearest the archway, and about 16 yards from it, it was inferred that there might be a plug of ice about that archway. Into this first lamp there were poured about 4 gallons of the chloride solution. This was done about 2 o'clock, and at 4 o'clock the pipes were all right.

Besides these considerations, there is the question of economy. Formerly, undrinkable alcohol was chiefly employed. Although the quantity of chloride solution which must be used is greater than the quantity of alcohol, the cost is much less. The alcohol comes to about 11½ cents a pint. The chloride costs about 80 cents per cwt. To make a solution of specific gravity 1.23 to 1.26, one must dissolve about 50 lbs. in 6 gallons. The gallon of solution thus costs somewhat less than 6 cents. The average quantity used per lamp is about 3½ fluid ounces; the cost of this quantity is 0.124 cent. If alcohol be used, 2 fluid ounces might suffice; and this at 11½ cents per pint would cost 1.10 cents per lamp.

The chemical action of the chloride of calcium (a bye-product from the ammonia-soda process) upon the pipes is *nil*. It does not attack iron; and it has no effect upon caoutchoucs even after four months. Chloride of calcium is also finding its way into extensive use as a means of preventing meters from freezing.

THE AMERICAN GAS LIGHT JOURNAL

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Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks,
16 WALL ST., NEW YORK CITY.

JANUARY 25.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share. ☜

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	101	103
Central	500,000	50	—	90
" Scrip	220,000	—	95	100
Equitable	4,000,000	100	127	129
" Bonds	1,000,000	—	106	108
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	110	115
Mutual	3,500,000	100	122	125
" Bonds	1,500,000	—	100	102
Municipal, Bonds	750,000		—	—
Northern		50	—	—
" Bonds	150,000	—	—	100
Standard Gas Co—				
Common Stock	5,000,000	100	38	42
Preferred	5,000,000	100	82	85
Yonkers		50	112	—
Richmond Co., S. I.	346,000	50	—	—
" Bonds	20,000	—	—	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	123	125
Citizens	1,200,000	20	98	99
" S. F. Bonds	320,000	1000	—	103
Fulton Municipal	3,000,000	100	130	135
" Bonds	300,000		102	—
Peoples	1,000,000	10	82	87
" Bonds (7's)	368,000	—	100	—
" " (6's)	94,000	—	100	—
Metropolitan	870,000	100	100	102
" Bonds (5's)	70,000	—	100	—
Nassau	1,000,000	25	130	135
" Ctfs	700,000	1000	99	100
Williamsburgh	1,000,000	50	120	127
" Bonds	1,000,000	—	107	110
Out of Town Gas Companies.				
Boston United Gas Co.—				
1st Series S.F. Trust	7,000,000	1000	90½	90¾
2d " " "	3,000,000	1000	79½	80
Bay State Gas Co.—				
Stock	5,000,000	50	58½	60
Income Bonds	2,000,000	1000	98	102
Buffalo Mutual, N. Y.	750,000	100	110	—
" Bonds	200,000	1000	95	100
Citizens, Newark	1,000,000	50	155	160
" " Bonds.	45,000	—	—	—
Chicago Gas Company.	25,000,000	100	76¼	—
Chicago Gas Light & Coke Co.—				
G't'd Gold Bonds	7,650,000	1000	87½	88
Equitable Gas & Fuel Co, Chicago, Bonds	2,000,000	1000	—	97½
People's Gas and Coke Co., Chicago—				
1st Mortgage	2,100,000	1000	100	—
2d "	2,500,000	1000	96	—
Consumers Gas Light Co., Jersey City	2,000,000	100	12	15
Bonds	600,000	1000	70	75
Cincinnati G. & C. Co.	7,000,000	100	—	200
Consumers Toronto	1,000,000	50	169	172
Central, S. F., Cal			90	—
Capital, Sacramento, Cal			58	
Consolidated, Balt.	11,000,000	100	48⅛	48¼
" Bonds	6,400,000		107	107½
Citizens Gas Lt. Co., Rochester, N. Y.	500,000	—	85	110
Bonds	250,000		—	—
East River Gas Co., Long Island City	1,000,000	100	100	105
Bonds	500,000	100	100	102
Hartford, Conn	750,000	25	120	128
Jersey City	750,000	20	180	200
Louisville, Ky	2,570,000	50	125	130
Little Falls, N. Y.	50,000	100	—	100
" Bonds	25,000	—	100	103
Laclede Gas Light Co., St. Louis, Mo.—				
Common Stock	7,500,000	100	22½	22⅝
Preferred "	2,500,000	100	63½	64
Bonds	9,034,400	1000	83	84
Montreal, Canada	2,000,000	100	200	208
Memphis (Tenn.) Gas	750,000	100	40	—
" Bonds	240,000	100	103	—
New Haven, Conn		25	200	—
Oakland, Cal			34¾	35¼
Peoples, Jersey City		—	115	125
" " Bonds			—	—
Paterson, N. J		25	99	102
Rochester, N. Y		50	99	100
Syracuse, N. Y	500,000	25	—	—
San Francisco Gas Co. San Francisco, Cal.	10,000,000	100	63	63½
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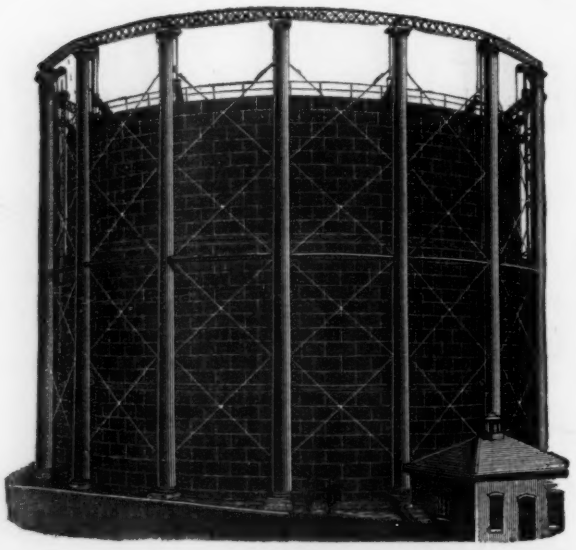

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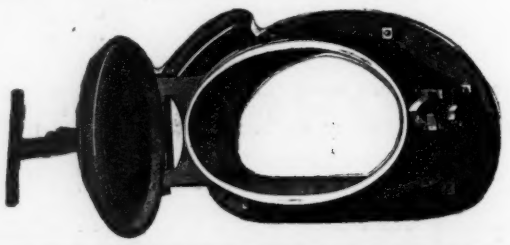

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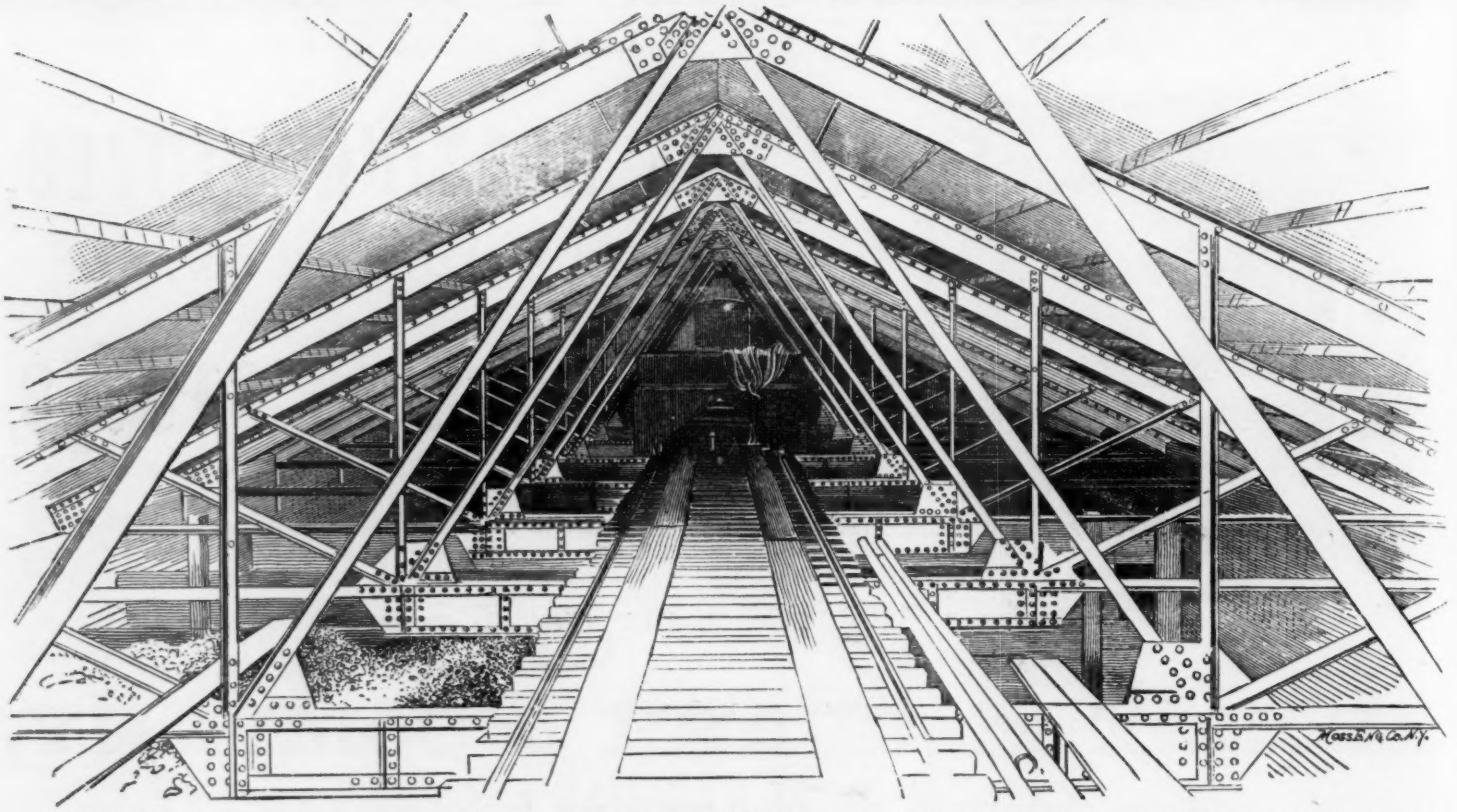

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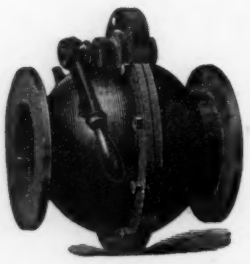

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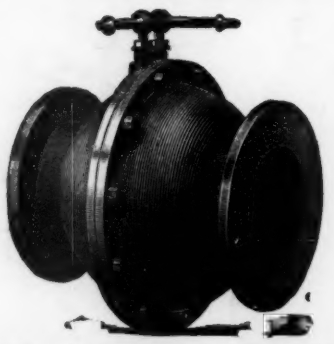

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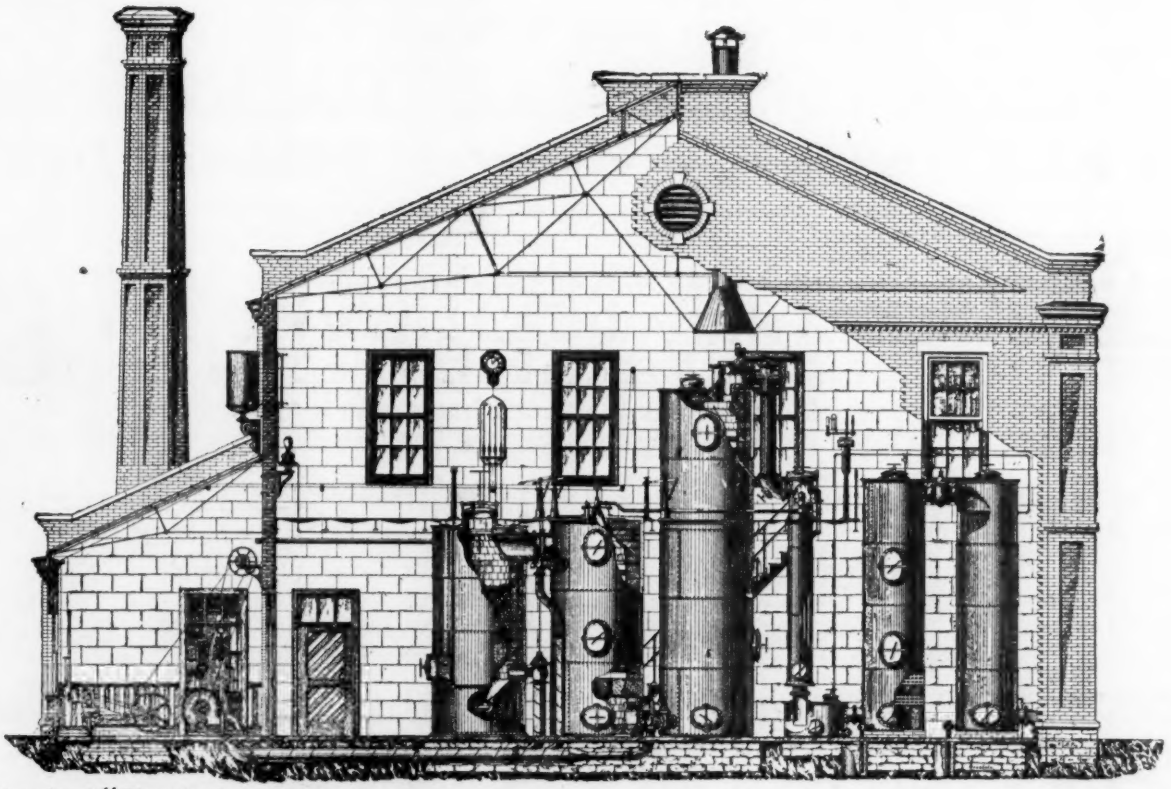

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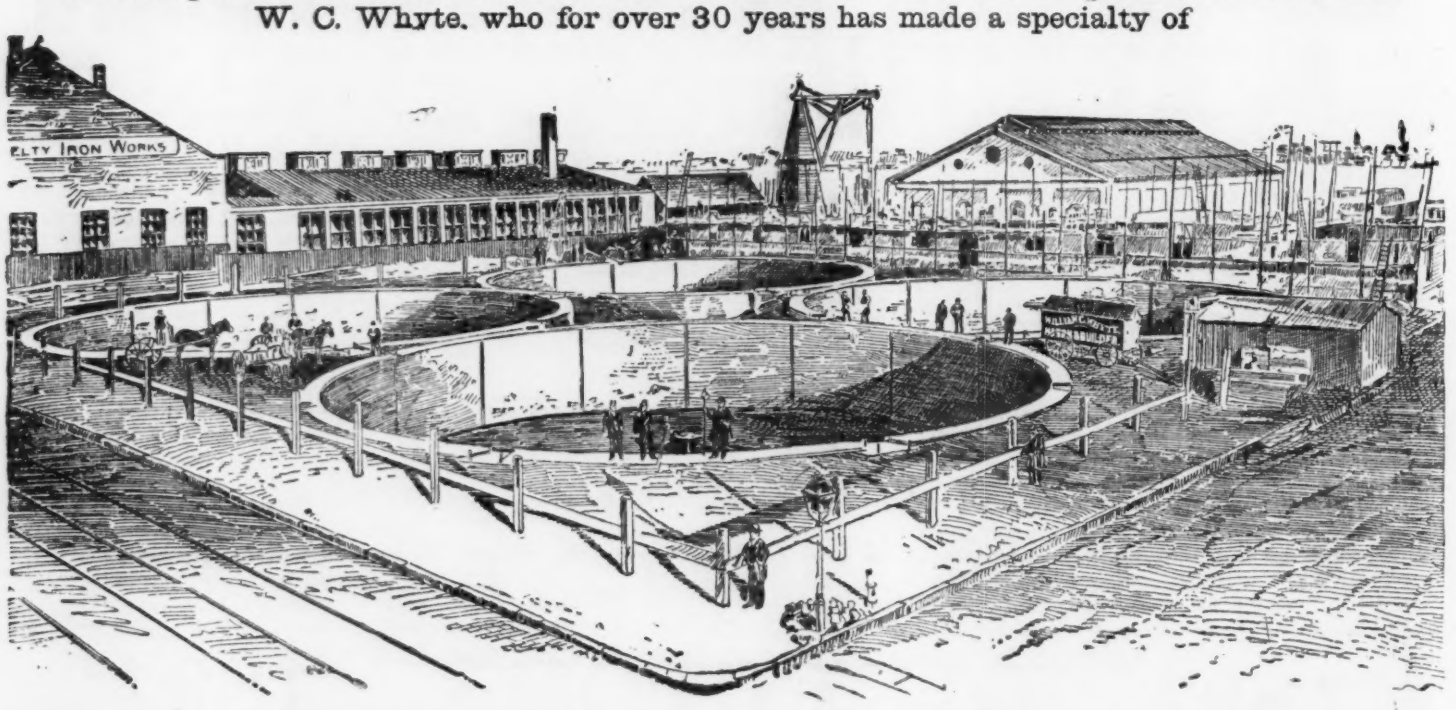

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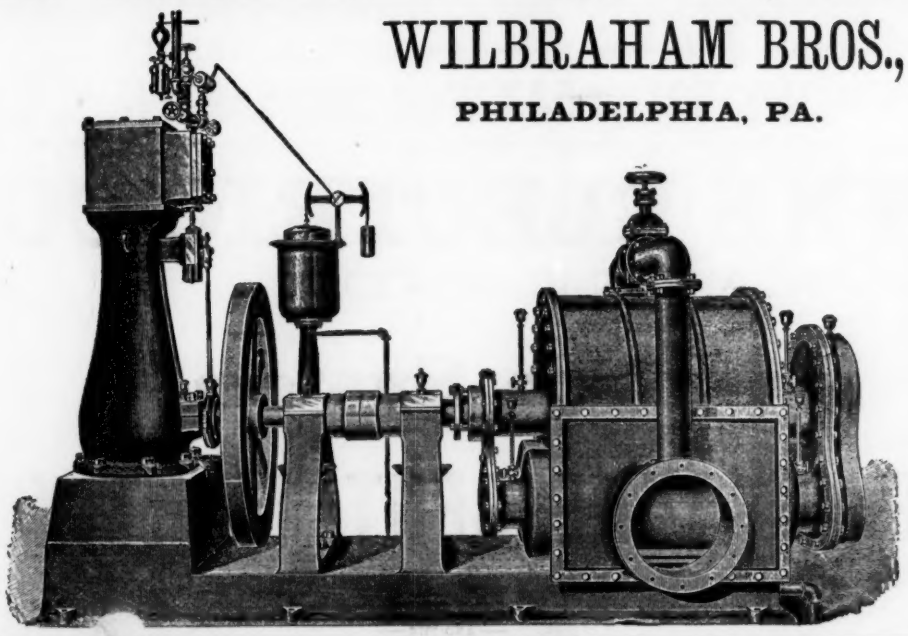

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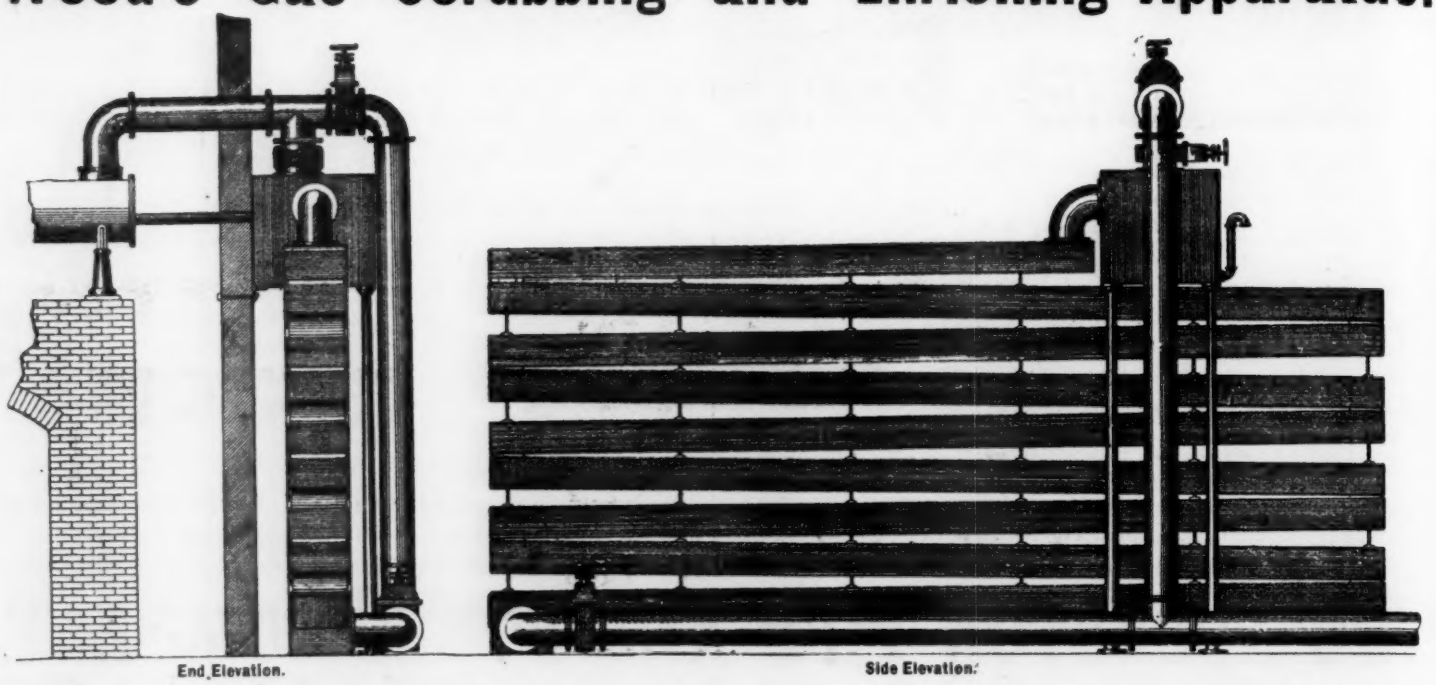

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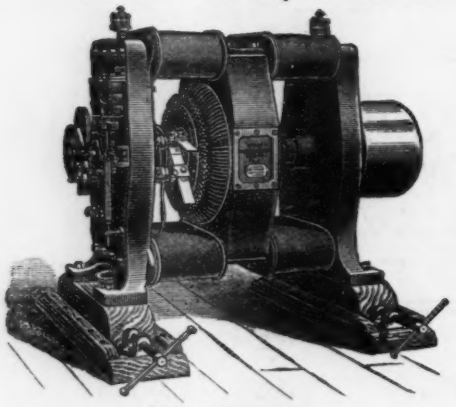

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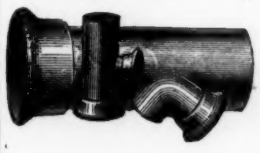

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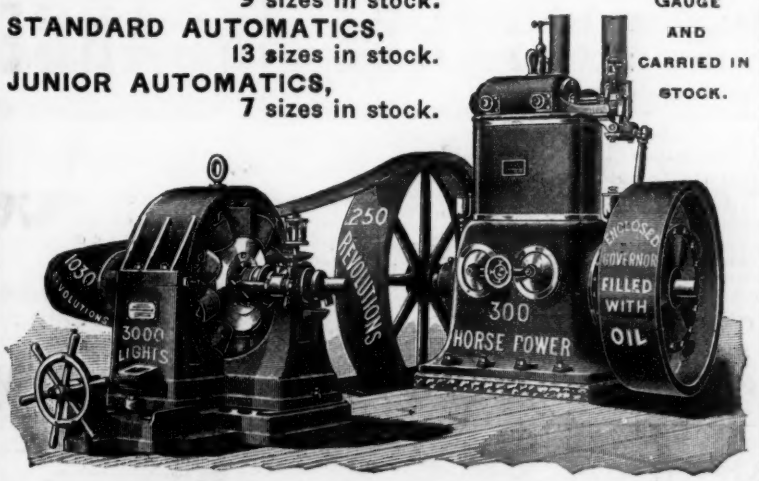

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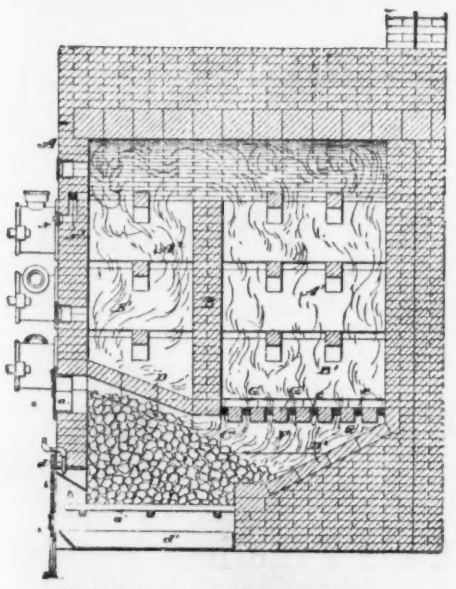

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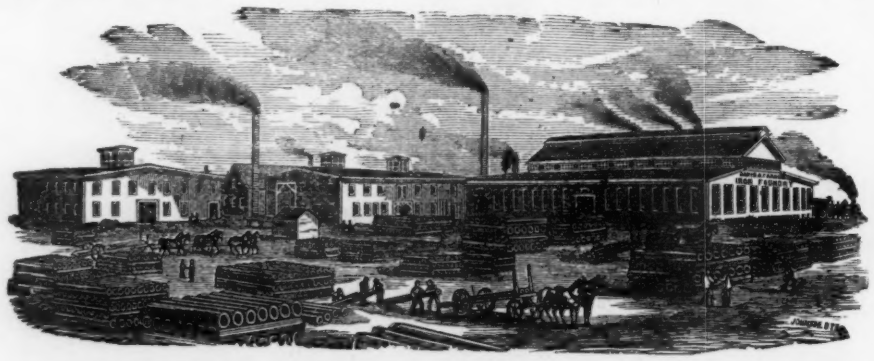

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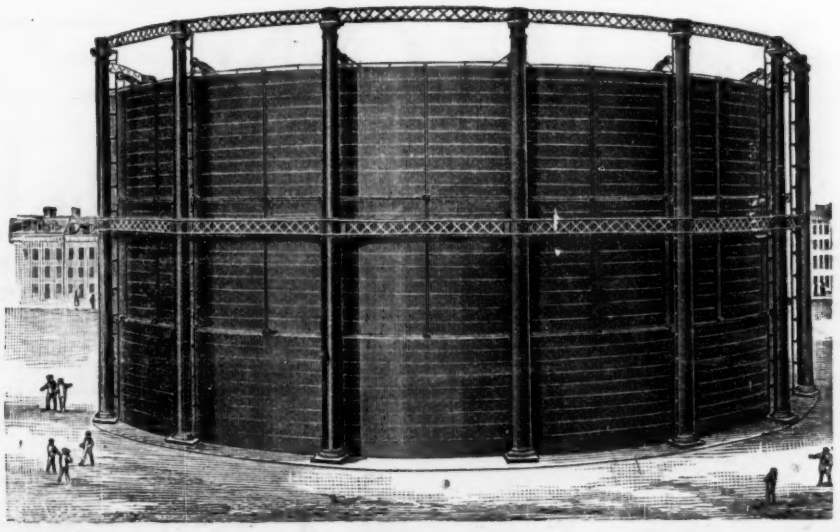

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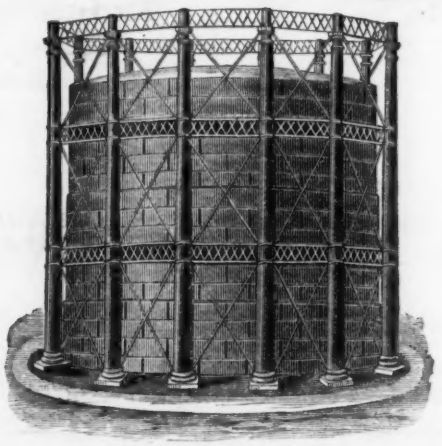

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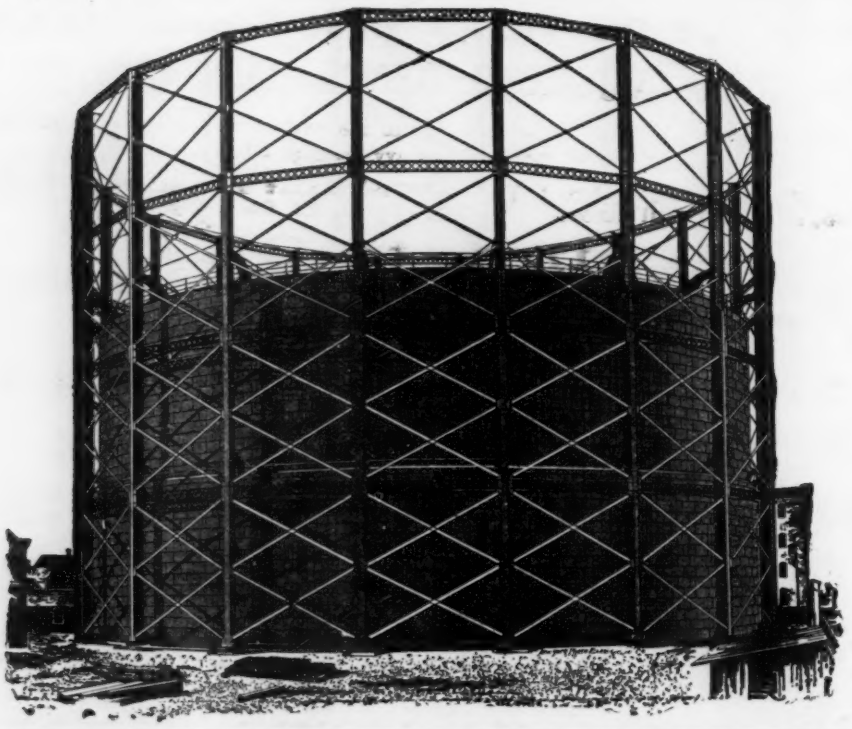

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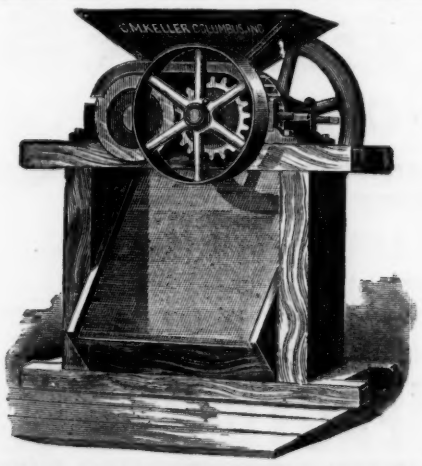

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